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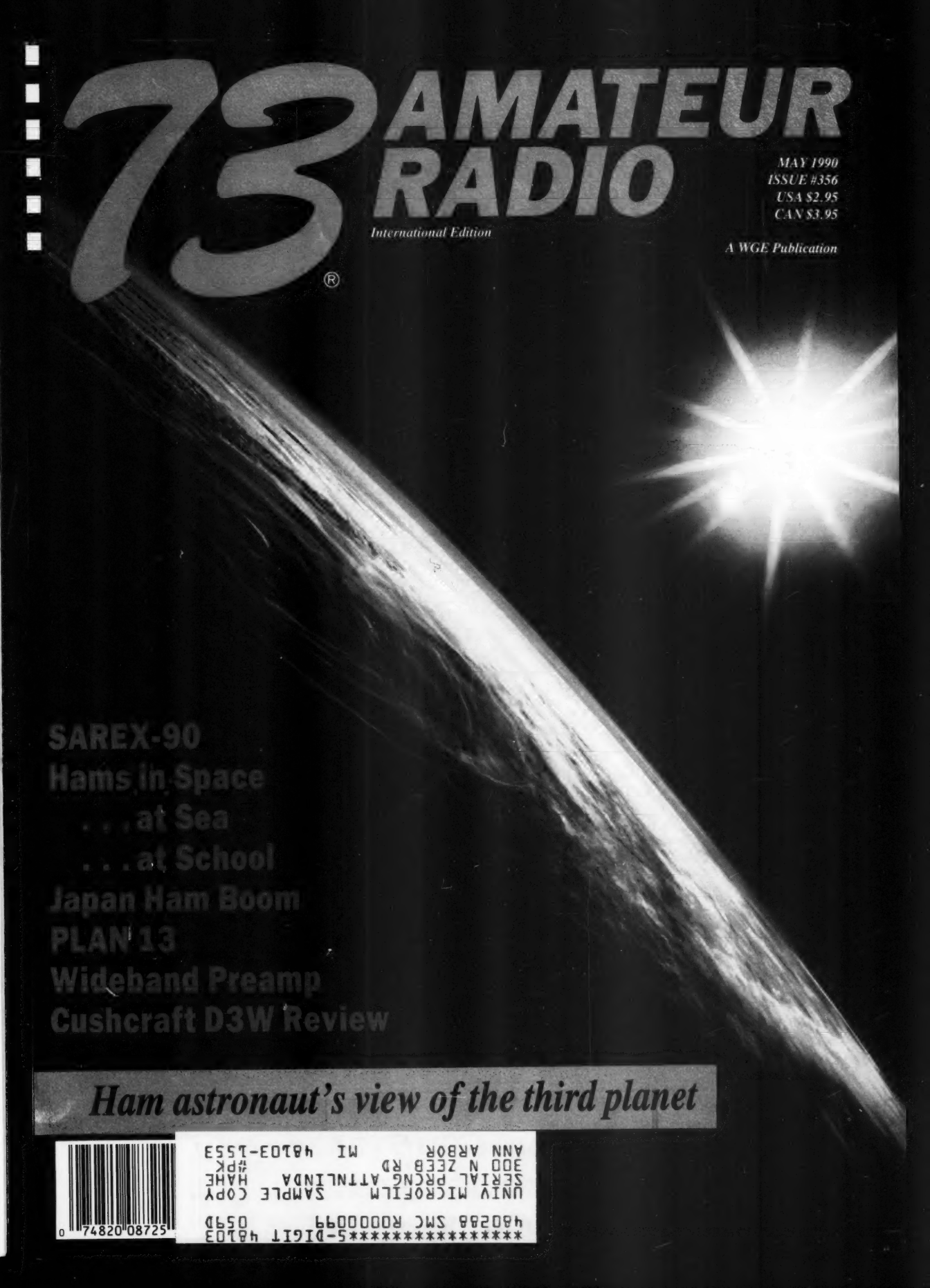

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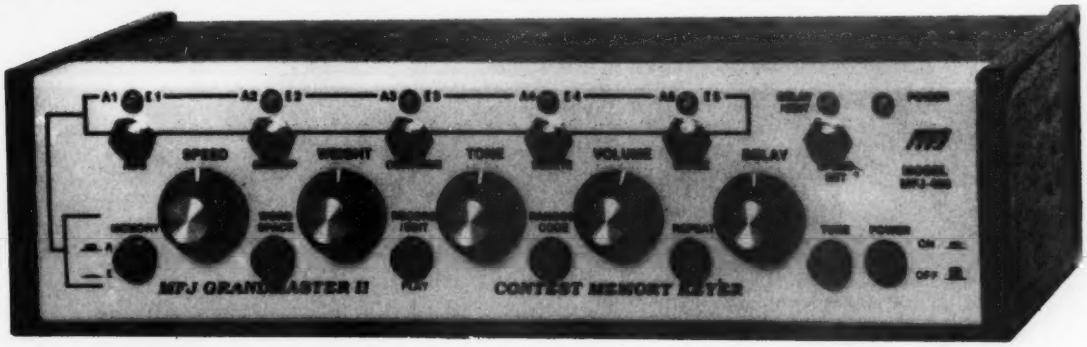

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LETTERS

From the Hamshack

Not Just Signal Reports

Wayne, want you to know that your "Never Say Die" was just superb! You said it all! I've finally got the XYL to take an interest in Ham Radio because it relates to the rest of the world; she heard me check into the "world peace net." "Yes," I told her, "hams do more than give signal reports and have CQ contests."

Floyd Huyber
Wilton WA

Solace from an Old Friend

I've been underestimated by headhunters. I have been misunderstood by employment agencies. I have felt ignored at business card exchanges. I have been forsaken by would-be girlfriends. I have despaired at the prospect of "temping" for the rest of my life. None of the foregoing have seemed to care much that I have a doctorate in communication studies, that I focus my energy on any job I undertake, and that at age 35 I am still curious and open to much going on in this marvelous world. In short, I'm ill with the disease of underemployment, like so many in these days of corporate greed, lying by euphemism, and sheer economic insanity.

As a consequence, I've sought therapy in an old friend—ham radio. When I'm building my Radiokit QRP-20, the old skills emerge in a context that really does matter: The resistor's color code has to be read correctly. The capacitor's polarity has to be observed. The toroid has to be wound and coated carefully. The transistor has to be oriented and soldered properly. The IC has to be handled delicately. The chassis has to be drilled and deburred for correct and meaningful board placement. The motor skills, the background, knowledge, and the attentiveness to detail *not even noticed or queried about* by headhunters, employment agencies, or temp (I hate that word) counselors have, at every step, figured critically in the successful construction of this little kit. No wonder, then, that when I finally turned on the little transceiver, and a soft static rushed vibrantly through the wires to my headphones, I felt joy in the successful accomplishment of a project with concrete results.

The lesson here, perhaps lost on hams who have decent jobs or on hams who use their hobby for public service, rag-chewing, or DXing, is that ham radio can function as therapy—a stabilizing force in a work world filled with idiots, incompetents, and the illiterate.

Mark Rodgers KB8CNT
Trenton NJ

Ham Riffraff

Until recently I had not paid much attention to nor even noticed the inconsiderate operators in our midst.

I was listening to a couple of hams on 10m the other afternoon who were trying to carry on a conversation. Every time one of the gentlemen would try to talk, a third party would break in purposely interfering with their conversation. This "no-mind" would try to jam the conversation by saying "squash squash smash smash." This type of behavior reminds me of the things we used to hear on the CB channels during the heyday of that service.

Every time the issue of the no-code license is brought up, someone voices the opinion that eliminating the code will turn the amateur bands into another CB. Some hams feel that the code is the only way to keep the riffraff out. Ladies and gentlemen, the riffraff are already here. The code test does not keep these people off the air. It is as you say, Mr. Green, up to those of us who enjoy the hobby to see that this type of behavior does not continue. We need to be more involved monitoring the bands and sending "gentle" reminders to those who want to violate the rules. Perhaps a personal visit by 20 or 30 club members would get the point across.

Rich Hanzlik N7NGK

CAP Lt. Speaks

There are times when I feel like a man on a wanted poster. I am 26 years old, college educated, and a field service engineer. I have built receivers and transmitters of my own design. I know about half of the Morse code alphabet. I own four modern digital 2m radios and I build my own antennas. I have SSB voice and data operating privileges near the 80 and 15 meter bands and FM voice and data privileges near the 2 meter band. I am constantly setting up packet radio stations for friends. I am a very active computer, radio, packet, and data telecommunications hobbyist. But I am NOT a ham!

I've always wanted to be a ham. I hold the Amateur Radio Service in very high regard. Several times I have set my sights on the Technician Class license, but each time I lost interest when I began monitoring the ham bands. Your editorial in the December 1989 issue helped me understand why.

I don't care what kind of equipment another operator uses unless I'm considering purchase of similar equipment. I am only slightly interested in the person's QTH. I AM interested in what circuits they have built, what unique solutions they have for common problems, and what kind of life they lead. I guess this would label me a rag-chewer, and therefore no contester would ever want to talk to me (thank God!). Not that contesting is bad, it does develop excellent operating skills. But to do nothing but advertise how much spare cash someone has to spend on a hobby, and wave one's radio-machismo, is not helping amateur radio at all.

I don't lack an elmer, either. I can count eight General Class operators among my good friends. I have helped them design and install antennas, build packet radio stations, and I have fixed their computers. But I am NOT a ham!

As a member of Civil Air Patrol, I have been graciously allowed operating privileges that rival Technician Class. This has provided me with much needed radio experience, and has filled the gap that amateur radio would have filled. And I have become aware of how to kill an otherwise healthy organization. CAP, like the Amateur Radio Service, is a dynamic volunteer service with lots of interesting things for members to get involved with. However, it is beset with an Old Guard with its own ideas. This tends to stifle good times and good public service. The only thing that has saved our Cadet Program is that the Cadets are led by a Cadet Commander who is young.

NOW I WANT TO BECOME A HAM!

Yes, I now have Ham Fever again. Not because I want to find out that it's raining in Cleveland, but because I can make a difference. It does my heart good to know that a ham public figure feels the same way I do. Now I know why I lost my momentum before. Now I know there is something for me to do once my ticket arrives. I can contact W2NSD and have a long chat with the most interesting person in amateur radio I know. As for those boring souls whose whole life begins and ends at the microphone, they can sit by the sidelines and complain about us damn rag-chewers. If they choose to interfere, they will get no more gratification than an invitation to join the discussion. I have a need to know my fellow man, and amateur radio is a great way to do it. I have supported amateur radio all my life. I even read most of the ham publications. Now it's time for me to join the crusade for a new Ham Community.

James Fogg
(Lt. Fogg, CAP, KCC592/
Freedom 644 Mobile)
Bellingham MA

Cleaning up the QRM

Wayne, we have done as you recommended and elected a "Clean Up the Airways" committee. You said you would publish our name in *73 Magazine*. Here it is: Academy Amateur Radio Club, meetings held in Auburn, Washington. The Chairman of Committee is Don Miller WA7FIC, who is also the secretary/treasurer of the club.

Ken McGaughey WX7V
President, AARC
Eatonville WA

DX Embarrassment

The Norwegian DXpedition to Bouvet Island (3Y), one of the rarest of rare DX islands, could have been one of ham radio's shining moments. Needless to say, the worldwide spotlight brought to bear on 14.145 MHz was just too much for some hams to leave alone. In order to allow some operating "elbow room" the first 2 weeks, the Bouvet hams were 5 kHz off the US band and they listened, over an admittedly very wide range, for US operators.

No sooner did one errant ham transmit on the wrong split VFO than dozens of "helpful" policemen let him know—right on Bouvet's frequency. Then each freq-cop had to be insulted by others telling him/her to be quiet! That, combined with intentional CQs and assorted garbage, brought innocent cries of "Enough!" and "You're disgusting!" right on the out-of-band frequency. The Mexican and Canadian operators, who had every right to be there, left the frequency in horror.

Fortunately, most of the tens of thousands who called from within the 20–30 kHz of US band space resisted giving comments. But the damage is done . . . on the heels of a Panama invasion, US amateurs now take on the foreign phone band!!

Let's hope sanity returns to DXing, and that other hams will still journey the thousands of life-threatening miles to give us all that rare chance at a rare country.

Hank Goldman WA2ORG
Riverdale NY

Attracting Youngsters

I have a solution! Maybe we can attract youngsters to our hobby by starting something similar to what the merchants in my small city of Whiting, Indiana, do every fall and spring. They have "Frontier Days," during which they move their wares onto the sidewalks and streets in front of their stores for the people to see and buy. It works!

My idea is to move my shack into the front yard as often as weather permits during the kids' summer vacation. We could set aside a national field day where every city in the US would have ham shacks in the front yards communicating up a storm. Show them how and let the kids communicate! Why hide our equipment inside where few people other than visitors can see it? It may not work, but I will damn sure give it a try this summer. Using my existing antenna, it shouldn't take more than five minutes to be in business. I can visualize crowds of inquisitive children around my shack.

Kids aren't lazy. They just haven't had enough exposure to our hobby. Once a year at a shopping mall is not enough. Front yard field days seem much better to me. What do you think?

Bill Haddad WD9HXH
Whiting IN

Need Publicity and Image

I have been meaning to write to you for several years. Your freestyle but pointed editorials never cease to entertain and provoke thought in me. Each of your issues of *73* are read with avid interest, cover to cover.

A nonham reading a story about radio amateur activities today generally doesn't picture himself participating. Why? First, that potential vision is not reinforced. There is very little publicity about the amateur service, even when they perform monumental tasks (the New York Marathon is one example). When some of the stories do leak out of the box, they are couched in misinformation and dull reportage.

In order to entice the new amateur, we need to stress the dramatic aspects of the hobby. The ham who first contacted earthquake victims or the ham who helped save a sailboat at sea. Let's have an astronaut contact some Novices, not the Dayton Cliquefest. Get that story in some newspapers. Send the publicity to the services that communicate with schools.

We need to stress how heroic and stirring it is to use communications and perform useful and critical functions. And we need to stress how good you feel when you participate in the service. These are real feelings from real experiences.

I also have to give you an opinion of the conversations I hear on 2m (I'm still listening). Your readers are absolutely correct, from Holly, New Jersey to Marina del Rey. I really have to search (thank God for scanning capabilities) to find a conversation that's a step above insipid. Keep placing the burrs under their saddles. The hobby needs the stimulation.

Ciro L. Petti
Randolph NJ

73 AMATEUR RADIO

MAY 1990
Issue #356

TABLE OF CONTENTS

FEATURES

9 SAREX-90
Ham-In-Space Shuttle Missions.
... W3IWI, WA4SIR, W3XO

18 Sharing the Adventure with Young People
Maritime ham classroom with a conscience. KA1UKM

20 An Interview with Carole Perry WB2MGP
Who's new in ham radio.
..... KB2IGG

24 The Biggest Ham Country—Japan
Plus 9600 baud packet and tree antennas. WA1LBP

45 Tri-State Anti-Drug Air Show
Amateur radio ops say "Yes" to "Say no" WB8YKS

ICOM America Service

The ICOM Service Survey by Gordon West WB6NOA, scheduled to appear in this issue, has been moved up to the June issue. Look for it then!

SAREX ground crew. See page 20.

HOME-BREW

31 Wideband Preamplifier
IC cool. VE3EFC

35 A "Rad Radiator" For Your Walkie-Talkie
Replace your rubber ducky with a dipole. W8MDV

REVIEWS

14 Using PLAN 13
Track OSCAR 13
. ..... WB6JNN/9

32 The Cushcraft D3W
WARC band special.
..... WA4BLC

Cover by Alice Scofield.
Cover photo courtesy of NASA.

DEPARTMENTS

77 Above and Beyond
72 Ad Index
76 Ask Kaboom
53 ATV
85 Barter 'n' Buy
88 de K6MH
84 Dealer Directory
60 DX
17 Feedback Index
66 Ham Help
17 Ham Profiles
46 Hamsats
80 Homing In
72 Index: 5/90
1 Letters
38 Looking West
4 Never Say Die
56 New Products
58 Packet Talk
81 Propagation
68 QRP
7 QRX
82 73 International
64 Special Events
86 Uncle Wayne's Bookshelf
47 Updates

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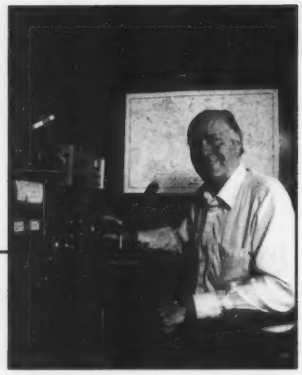
NEVER SAY DIE

Wayne Green W2NSD/1



73's Anniversary!

I remember it just like it was 30 years ago . . . the day I was fired as editor of *CQ* magazine. It was five years, to the day, from the time I was hired to rescue *CQ* from going under.

At the time it was losing, in today's dollars, about $20,000 a month. By 1959 I'd built it up to where it made a profit of $1m that year. After five years I felt I rated a raise. Wrong.

Like anyone else suddenly on unemployment, I had to figure out what I wanted to do next. My love of amateur radio had goaded me into giving up a very good job running a loudspeaker company to help save *CQ*. Promises of great rewards if I succeeded helped too. Alas, there were no great rewards, just firing. Oh, I did get a promise that the $100,000 I'd advanced to help the magazine out of a hole would be repaid. Nothing yet, but heck, it's only been 30 years and I'm patient. That check will come, I'm sure. Hmm, let's see, at 8% interest that'd be about $1,0[illegible],250. Yeah, I could use that. An extra million will always come in handy, right?

QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, WGE Center, Forest Road, Hancock, NH 03449. Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

I got fired on January 5, 1960, right after Christmas. Hoo, do I remember that Christmas? Cowan, *CQ*'s publisher, celebrated his $1 million net profit from *CQ* that year with a big $5 Christmas bonus for me, making him my hands-down candidate for the Scrooge of the decade.

Since my loudspeaker firm had gone from 100% growth per year to bankruptcy a few months after a new manager took over the company, I decided I'd stay in publishing. I felt there was a serious need for a new ham magazine, one which would emphasize home construction and new technologies.

Indeed, what got me involved with *CQ* in the first place was my fascination with digital communications and RTTY. I have this genetic defect which has caused me incalculable misery all my life. When I see something which someone should do . . . and no one does it . . . I say "heck," and do it. Well, actually, I say something stronger than that, but I don't want to disillusion the many religious nuts who bumble into reading my editorials and who would be terribly offended by what I really say when I give up waiting and start a new, needed, project.

In 1951 I gave up on anyone else starting an RTTY publication and started *Amateur Radio Frontiers*. This quickly escalated to over 2,000 paid subscribers and led to a regular column in *CQ*. I put it out in my "spare" time while I was building the speaker company from a borrowed $1,000 to $2m in annual sales over a four-year period. I edited it, wrote my usual long and controversial editorials, drafted all the schematics myself, took all the equipment pictures with my grandfather's 5x7 plate camera and did my own darkroom work.

Having been booted out at *CQ*, I did some estimates of what it would cost to start a new ham magazine and made the rounds of wealthy hams, looking for some venture capital. No one was interested. So I sold off everything I could . . . my Porsche, Chris Craft, my plane . . . and rounded up just barely enough to put out the first issue of *73*.

The first few years with *73* were mighty tough. I'd just barely got it going when the ARRL pulled that Incentive Licensing insanity on the hobby. That killed off 85% of the ham dealers and 90% of the manufacturers in just a few months. It put most of the ham clubs out of business too.

It wasn't until I became convinced in 1969 that FM and repeaters would save the day for the hobby that things started to turn around . . . for both amateur radio and *73*. Oh, I'd helped pioneer SSB in both *CQ* and *73*, and pushed solid-state in *73*, but it was repeaters which really took off.

Since the other ham magazines were completely ignoring repeaters, my genetic defect kicked in, forcing me to publish hundreds of FM and repeater articles . . . book after book . . . and hold repeater symposiums around the country to help get repeater clubs coordinated. Within two years a new $100m industry was started. It quickly became the most popular ham activity in America . . . and then the world. Today we have cellular radio as the direct result of this ham pioneering.

When the first microcomputer came on the market in 1975 I looked for someone to start a magazine to help this new field grow. When nothing happened my genetic do-good defect did it again, forcing me to be the first publisher of *Byte*. Perhaps I could do for microcomputers what I'd done for repeaters.

It hit again when the compact disc was put on the market in 1983. Someone really should start a magazine to help sort out the good and bad CDs. I gave up waiting and started *CD Review* in 1984 and CDs have become quite an industry . . . about $15 billion this year.

So here I am in 1990, 30 years after starting *73*. I'm still as interested in hamming as I was 30 and 50 years ago. An HT goes with me everywhere. I had one with me out in L.A. and San Diego on my recent trip. Alas, I couldn't find one single repeater that wasn't off limits to visitors, so I wasn't able to make a contact.???

But most of my time these days is being spent trying to help the independent music companies compete with the six international megacorporations which, together with MTV, control the music business.

My recent editorials on the code have brought in a surprising number of letters from frustrated pre-hams who have jumped on my speed learning system to get their tickets. That got me to thinking, since *Ham Radio* and *QST* aren't on the newsstands and thus are not in a position to help attract newcomers to our hobby . . . and since *73*'s newsstand sell through is quite high . . . what changes might I make in *73* which might increase the general public's interest in amateur radio?

Well, one put-off could be the name of the magazine. As long as we are mainly interested in getting hams as readers, *73* is a great name for the magazine. But if we're going to use the magazine as bait to attract newcomers, perhaps some slight name change would be in order.

Change the name of *73*? Heavens! Good grief, we can't do that! Oh, heck, sure we can. I've always changed the titles of my magazines when I found the market changing. *CD Review* started out as *Digital Audio* . . . back when most of the early CD users were techies. *Microcomputing* was *Kilobaud*, when most computerists were techies.

The new name won't be all that much of a change. We'll de-emphasize the *73* and embolden *Amateur Radio*, adding *Today*. We'll see if that helps get us some interest with today's youngsters. Yes, I wish someone else would do it, but they haven't, so (expletives deleted), I'll do it.

We'll start *(73) Amateur Radio Today* with the October issue . . . celebrating our 31st year of publication.

Though I'm in good health, the recent death of Malcolm Forbes shows just how much a roll of the dice is involved in getting old. I keep busy, mindful of Forbes' dictum. He said he was busier than ever because he had fewer years to accomplish things than before. Me too. So I keep busy, starting new publications . . . each designed to do something which needs to be done . . . getting in skiing, scuba diving, hamming, nuclear submarine piloting, and so on when I can.

As I've mentioned before, I've survived close calls from electrocution, falling off high buildings while erecting antennas, getting killed in wars, car accidents, and even had a very close one with colon cancer. These lucky breaks have gotten me into my late 60s. Now, will heart attacks, strokes, Alzheimer's and the thousands of other disasters which are contributing to the full pages of Silent Keys in *QST* allow me a few more years to achieve my goals? It's a dice throw. My luck has held out surprisingly long, so we'll see.

When I do finally go, I want to thank all of you who have helped me accomplish what few things I've done to help the world progress a little. I've led an interesting life. A very interesting life.

The response to my desktop publishing editorial was beyond my expectations. I'll bet I got a couple hundred very good responses to that one from hams interested in starting their own publishing businesses.

One more thing. The Music/NH ad on pages 48–50 . . . it's there because I'm a hopeless romantic as far as

Continued on page 70

KENWOOD

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Warp Drive!

TS-790A

Satellite Transceiver

The new Kenwood TS-790A VHF/UHF all-mode tri-band transceiver is designed for the VHF/UHF and satellite "power user." The new TS-790A is an all-mode 144/450/1200 MHz transceiver with many special enhancements such as automatic uplink/downlink tracking. Other features include dual receive, automatic mode selection, automatic repeater offset selection for FM repeater use, VFO or quick step channel tuning, direct keyboard frequency entry, 59 memory channels (10 channels for separate receive and transmit frequency storage), multiple scanning and multiple scan stop modes. The Automatic Lock Tuning (ALT) on 1200 MHz eliminates frequency drift. Power output is 45 watts on 144 MHz, 40 watts on 450 MHz, and 10 watts on 1200 MHz. (The 1200 MHz section is an optional module.)

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- **Other useful controls:** RF power output control, speech processor, dual muting, frequency lock switch, RIT.
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- SP-430 external speaker
- VS-1 voice synthesizer
- TU-5 CTCSS tone unit
- MB-430 mobile mount
- MC-60A, MC-80, MC-85 deluxe desk top microphones
- MC-48B 16-key DTMF, MC-43S UP/DOWN mobile hand microphones
- SWT-1 2-m antenna tuner
- SWT-2 70-cm antenna tuner
- PG-2U DC power cable

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QRX . . .

EDITED BY LINDA RENEAU KA1UKM

"Atlas" Radio Michael Harrison Indicted

On August 28, 1989 Michael Harrison was indicted by a Grand Jury in the Eastern District of New York on 50 counts of mail fraud. On February 14, 1990, Harrison was again arrested and incarcerated for violating the terms of bail, including failing to appear in court.

On February 26, 1990 Harrison pled guilty to 5 counts of mail fraud before Judge Jacob Mischler. Each count of mail fraud can carry up to a five-year prison term and a $250,000 fine. Harrison is expected to be sentenced on April 19, 1990 by Judge Mischler. Harrison is currently in jail while waiting for sentencing.

According to the *W5YI Report*, Harrison has a long history of fraud and swindling. Unbelievably, last January he ran an ad under a fictitious name, Robert Pearson, in the *Ham Trader*. Before "Atlas," he operated other scams under such defunct company names as Osborne Computer, Victor Technologies, and Webster Radio, under the names Marc Hansen, Edward Harrison, and John McNamara.

If you would like to write Judge Mischler, please address your correspondence to: Judge Jacob Mischler, US District Court, Long Island Courthouse, Uniondale Avenue and Hempstead Turnpike, Uniondale NY 11553.

Martin T. Biegelman, Postal Inspector of The United States Postal Inspection Service, is grateful to all of you who have provided assistance in the investigation and prosecution of Michael Harrison. If you have any questions, you may contact Inspector Biegelman at (516) 933–2416 or write him at PO Box 160, Hicksville NY 11802-0160.

Communicator Class License

On June 15, 1990, representatives of 18 VEC organizations will meet to determine their position on amateur teaching and testing in regards to the establishment of a codeless license.

In PR Docket No. 90-55, the FCC proposes replacing the Novice and Technician Class licenses with a codeless Communicator Class license. Operating privileges would be all authorized emission types above 220 MHz. All Communicator testing would be conducted under the VEC system.

Privileges for all existing classes would remain unchanged. Current Novices would have credit for 30 of the 60 questions. New Communicator Class licensees not previously Novices would gain full Technician class privileges, including 6 and 2 meters, plus certain HF operation, by passing any code test. Communicator "Plus" licensees would identify with "/AC" when operating below the 220 MHz band.

For information, write VEC Recommendations Committee, PO Box 565101, Dallas TX 75356. VEC chairman of the committee is Fred Maia W5YI. Other VECs organizing the committee are Raymond K. Adams N4BAQ and R.C. Smith W6RZA.

JAS-1b in Orbit

On February 7, JAS-1b, Japan's second amateur satellite, was successfully launched by the H-I vehicle No. 6 from Tanegashima Space Center of NASDA at 0133 UTC. Also on board were MOS-1b, the Marine Observation Satellite, and DEBUT, the DEployable Boom and Umbrella Test payload. MOS-1b was separated first, then DEBUT and JAS-1b were separated one by one, one hour after liftoff. JAS-1b was named "Fuji 2" in Japanese, but it may also be called "Fuji-OSCAR 20" as AMSAT-NA suggests.

JAS-1b is now orbiting with apogee of 1700 km and perigee of 900 km, inclination of 99 degrees and period of 112 minutes. For detailed information with operating schedule and instructions on how to use the Mailbox of JAS-1b, write *The JARL News*, Japan Amateur Radio League, Inc., 14-2, Sugamo 1-chome, Toshima-ku, Tokyo 170, Japan.

Robert W. Gunderson W2JIO Fund

A fund in memory of Robert W. Gunderson W2JIO, who died in 1987, has been started by the Alumni Association for Special Education. Bob W2JIO was the editor and narrator of *The Braille Technical Press*, the only magazine on electronics for the blind and deaf-blind. He taught amateur radio and electronics at the school for many years.

Bob toured the country, speaking to amateur clubs and exhibiting the auditory equipment he designed for the blind. He enjoyed activity in Army MARS. On Saturdays, Bob W2JIO worked at Hudson Radio in Manhattan as an electrical consultant. If you brought him a problem, he'd help you solve it.

Starting in June 1990, each year the Alumni will award a scholarship to a blind or deaf-blind student who is most deserving scholastically. The amount of the scholarship will largely depend on the contributions received. If you wish to contribute, please make your check or money order payable to the Robert Gunderson Memorial Fund Association. Address your letter in care of the Alumni Association Fund, Attn. Joseph Bruno, Treasurer, 420 W. 261 St., Bronx NY 10473.

Soviet Radio Club ACDXA

If you're a ham and a white-water rafter, monitor UA4WAR on 14277 or 14282 kHz at 0315Z weekends, or RA4WZ on 28650 kHz weekends. Soviet radio club ACDXA is looking for US amateurs to join teams for summer competitions. *(DX Bulletin.)*

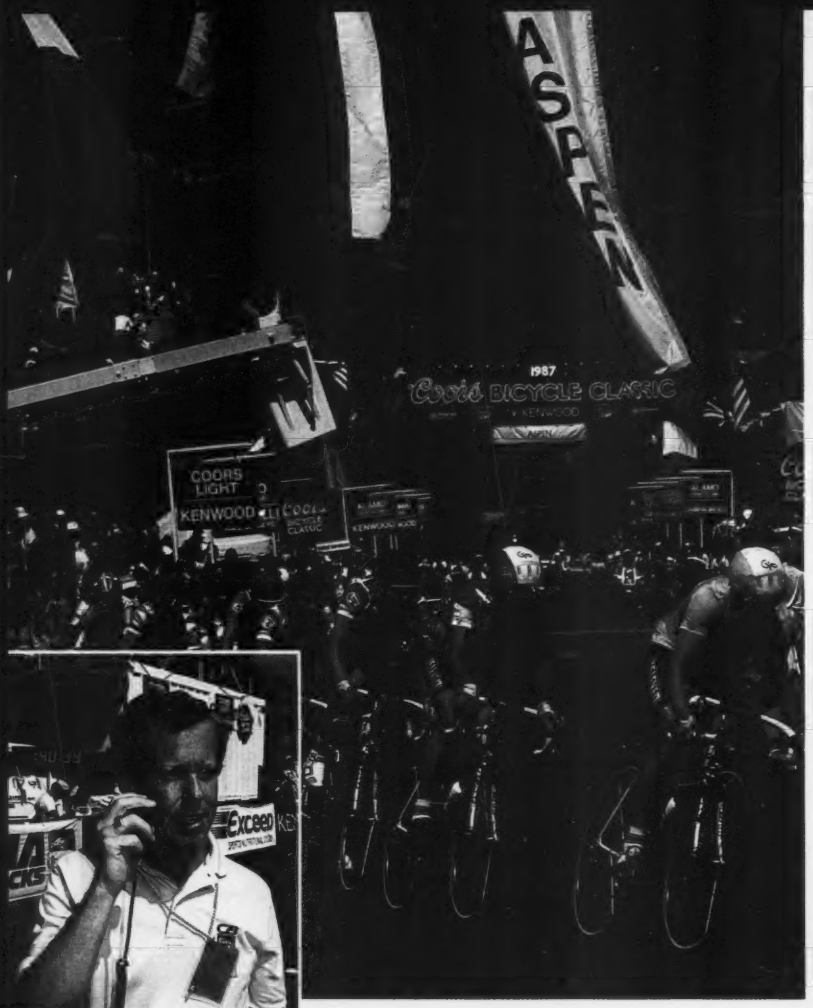
IPARN Satellite Test

Last January, using only VHF HTs, Canadian amateurs across western Canada communicated over a repeater network in British Columbia connected to a similar network in Alberta. The Inter-Provincial Amateur Radio Network used a narrow band SCPC format on the Anik C2 (Ku-band) geostationary satellite. The 7.5 kHz channel was operated on a PTT basis the entire month. The test included packet via satellite.

IPARN's goal is to build a nationwide VHF satellite-repeater communications network. The test, closely monitored by government and commercial interests, brought very positive comments from both. For more information, write IPARN, Dept. 290, PO Box 3156, Langley BC V3A 4R5.

We wish to thank all our contributors, as listed above. Keep the news coming in!

JAS-1b, Japan's second amateur satellite, was successfully separated from the H-I vehicle No. 6 an hour after liftoff.



"You're miles ahead with Larsen."

Rick Woodsome, Communications Consultant Woodsome and Associates, Boulder, Colorado

When the directors of the Coors International Bicycle Classic needed a sophisticated mobile communications system, they turned to communications consultant Rick Woodsome. As a communications specialist, Woodsome knows what it takes to make a communication system work.

That's why he turned to Larsen Antennas.

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Rick Woodsome

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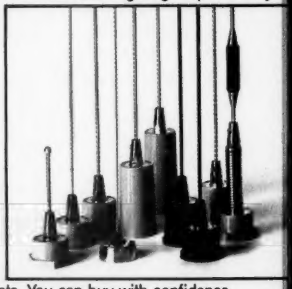

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SAREX-90

Ham-In-Space Shuttle Missions

by Tom Clark W3IWI, Ron Parise WA4SIR, and Bill Tynan W3XO

Remember the thrill when Owen Garriott W5LFL became the first "ham in space" on the space shuttle *Columbia* in 1983? Owen was followed two years later by Tony England W0ORE. Owen's flight had been limited to voice on 2 meter FM. Tony's added two-way SSTV (Slow Scan TV).

How did we manage to get hams in space? Through SAREX, the Shuttle Amateur Radio Experiment. The "experiment" designation opened many doors to future amateur radio participation in US manned space missions. Proposals to include amateur radio on these flights were submitted to NASA by AMSAT-NA and the ARRL. Earlier attempts to have W5LFL operate an amateur station from *Skylab* had failed, so acceptance of these proposals came as a particular pleasure.

Ron Parise WA4SIR, an active AMSAT member, was selected as a Payload Specialist on a mission then scheduled for early 1986. Another ham-in-space opportunity! Ron was especially eager to include packet on his flight. Unfortunately, everything came to a screeching halt with the *Challenger* disaster. Ron's mission, Astro 1, was to be next after *Challenger*.

Plans did not resume until mid-1987. A renewed SAREX Committee gathered. Their task: To promote amateur operation from as many future US manned missions as possible.

Work Begins Anew

At the SAREX Committee's first meeting it was learned that despite the best efforts of the ARRL and AMSAT prior to the *Challenger* accident, SAREX was not included among the planned experiments on the new Astro 1 flight, STS-35. More letters to NASA were needed for approval. And approval by NASA wasn't all; any proposed shuttle experiment had to be thoroughly documented and subjected to numerous rigorous safety analyses and tests.

In the two years since the *Challenger*, various proposals were advanced to again include SSTV and to add an FSTV (Fast Scan TV) uplink experiment, as well as packet, to the SAREX package. In meetings the Committee held with NASA Johnson Space Center officials, it became clear that STS-35 would not have enough mid-deck locker space available for this full compliment of SAREX experiments, mostly because the mission was scheduled to last ten days, requiring more food and supplies than most shuttle flights.

At first it appeared that this would keep amateur radio out of the mission, but a decision was then made to shrink the SAREX payload by delaying the SSTV and FSTV experiments until STS-37 (more on that later), leaving STS-35 with just voice and packet. This shrinking was made possible by the development of a very small TNC, the Tasco HK-21, donated to the project by Heath. The availability of a new, much smaller power supply also contributed. These, along with the same Motorola 2 meter FM HT used before, would make up the entire electronics package. A new side window antenna would round out the amateur equipment.

But wait . . . if we're going to operate packet, don't we need a computer, or at least a terminal? In the years since the packet experiment was first proposed, NASA had equipped the orbiter with a GRID general purpose laptop computer. NASA refers to this as the PGSC, for Payload General Support Computer. One of these will be available for SAREX when it's not otherwise occupied.

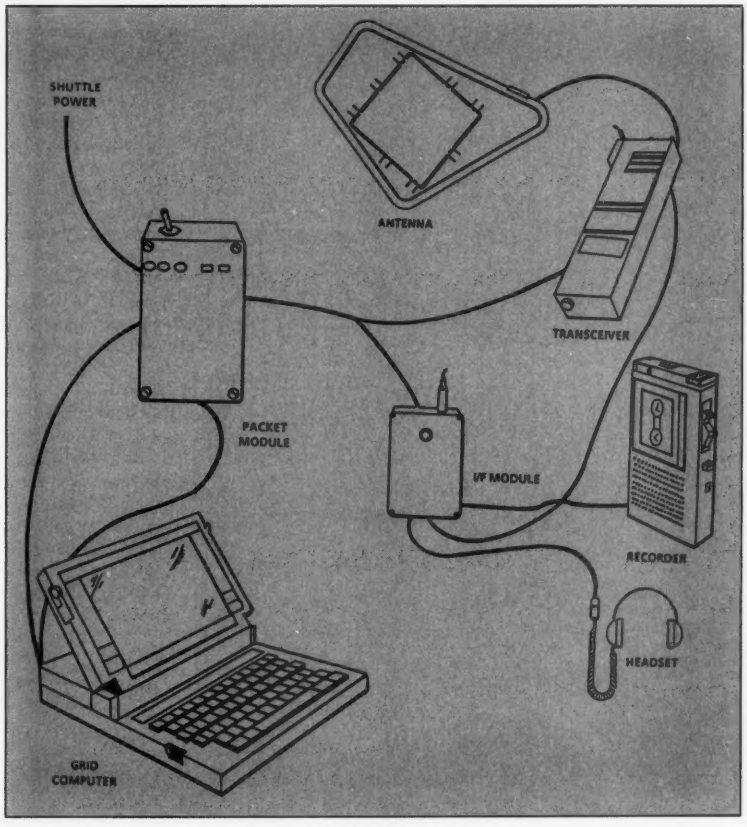

Figure 1. STS-35 Configuration.

STS-35's Orbital Characteristics

A major objective of ham-in-space operations is to expose young people, through amateur radio, to technology in general and to the space program in particular. Doing so, we showcase amateur radio and gain new recruits to the hobby. Unfortunately, the launch is at night, and flight plans for STS-35 present a major problem for our objective: due to the planned 28.5 degree inclination orbit, passes over the US will be less than ideal for classroom participation.

Many factors determine when, where, and by whom a spacecraft will be seen, such as: launch time of day, orbital altitude, and inclination of the orbit. Let's look at each of these, why they were

chosen for STS-35, and how they affect SAREX operation.

STS-35's inclination of 28.5 degrees means that the ground track of the shuttle will never go north of +28.5 or south of −28.5 degrees in latitude. Why would anyone choose an orbit that covered such a limited area? The answer is that a 28.5 degree orbit requires a launch azimuth of 90 degrees, or due east from the Kennedy Space Center. This takes maximum advantage of the earth's rotational velocity to achieve orbital velocity. A higher inclination orbit would benefit amateur radio coverage, but require more energy to attain the necessary velocity, and result in a lower orbital altitude.

The altitude of the orbit determines how much of the earth's surface can be seen from the spacecraft. Astro 1, the primary payload of STS-35, consists of a suite of four astronomical telescopes for observing ultraviolet and x-ray frequencies. An altitude of 350 km (219 miles) was chosen as the optimum height for this payload. For SAREX, this altitude provides line of sight (LOS) paths as far as 47 degrees north latitude and 47 degrees south latitude. All of the continental United States except for the very northernmost points will have line of sight opportunities.

The nighttime launch, required because of mission contraints of the Astro 1 payload, makes it impractical to put on in-school demonstrations by direct communication with the shuttle. Therefore, a relay plan is being pursued.

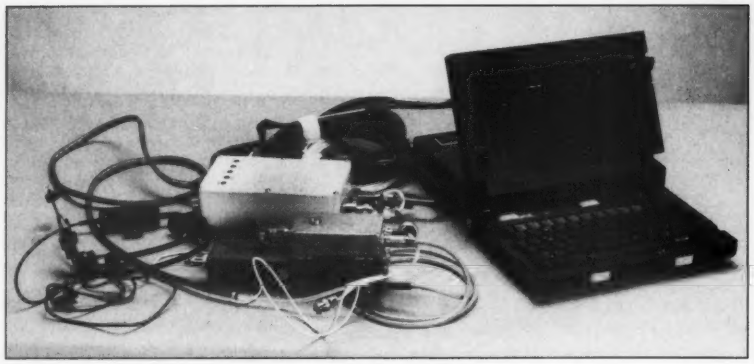

Photo A. STS-35 Packet Station.

Optimum launch time will be 06:00 GMT, or 2 AM EDT, which means that most of the passes over the US will occur during late evening or early morning.

Frequencies

Table 1 lists the frequencies presently intended to be used for FM voice and packet on both STS-35 and STS-37. SSTV on STS-37 is expected to use these same frequencies, while the FSTV uplink experiment on STS-37 will be around 436 MHz.

The primary pair, used on other shuttle missions, are 145.55 MHz as the downlink and 144.95 MHz as the uplink, the customary repeater offset. It fits 2 meter band usage in the rest of the world. The 145.55/144.95 MHz combination is present in both Groups 1 and 4, so that alternate uplink frequencies from Group 1 can be used over North and South America, and those from Group 4 would be used generally in other parts of the world. 145.55 MHz, used regularly by Soviet hams aboard *Mir*, has become the principle frequency for manned amateur space operations.

Note that NONE of the combinations listed are for simplex operation. DO NOT CALL THE SHUTTLE ON THE SAME FREQUENCY ON WHICH YOU HEAR IT. This procedure may be a little strange for packet folks, who are accustomed to working simplex, but everything works the same way as it does when you are operating on a single channel.

A word about frequency deviation for packet operation: Because of the approximately 3 kHz of Doppler implicit in the shuttle's orbit, it is best to keep transmit deviation to about 3 kHz. Otherwise, without Doppler correction, your signal may be so distorted that SAREX cannot copy you.

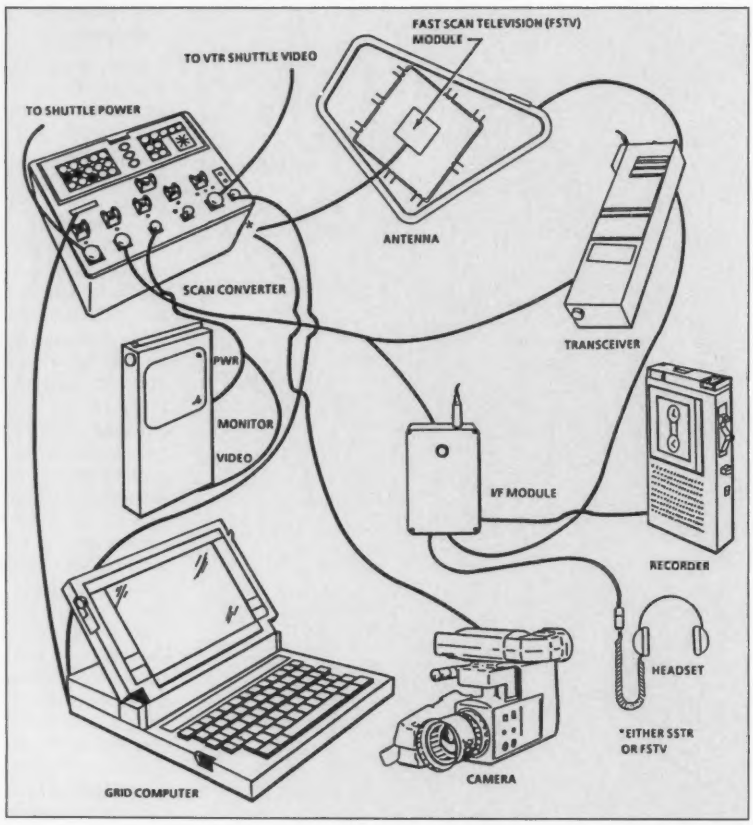

Figure 2. STS-37 Configuration.

Linking Up with the Schools

With SAREX classified as a secondary payload, its operating time comes after requirements for the primary payload have been met. Astro 1, a *Spacelab* payload, requires 24-hour operation, so Ron's normal 12-hour duty shift will be completely scheduled with ASTRO activities. The other 12-hour period must, of course, include some time for sleeping, eating, hygiene, change-of-shift briefings, and tending to any mid-deck experiments left, like SAREX.

The scheduling folks allocate eight hours for sleep whether or not one actually sleeps that long, leaving four hours free. These four are divided into two hours after the duty shift, before sleep (imaginatively called PRE-SLEEP), and two hours after getting up, prior to duty shift (you guessed it—POST-SLEEP!). Ron's PRE-SLEEP and POST-SLEEP periods are therefore the SAREX windows.

The good news is that these windows provide excellent coverage for Australia, Japan, South America, and South Africa. The bad news is that the US has poor coverage.

But maybe the bad news isn't so bad, since a tremendous effort is being mounted to provide coverage through a network of ground stations in other parts of the world, in conjunction with relay links back to the US. This network is similar to the one created for the AMSAT Launch Information Network Service (ALINS) in support of the recent Microsat/UoSAT launches.

At this end, a telephone bridge will be established to local repeaters. Volunteers across the country will be asked to contact local schools and offer to put on demonstrations of shuttle amateur voice and packet communications using their local repeaters as the final link to the school. A few schools will be selected to participate in actual two-way exchanges between students and the astronauts via amateur radio. For example, if the shuttle is over Australia, a two-way exchange between a US school and the shuttle can be arranged as follows: The school is linked via 2 meters to a local contact who patches them into the telephone bridge. This bridge is then used to hook up with an Australian station who phone patches the conversation up to the shuttle. Repeater groups who would like to hook into the telephone bridge to monitor these activities should contact AMSAT or the ARRL.

This approach involves many more amateurs directly in SAREX operations, and showcases the impressive capability of the international amateur community to set up a worldwide ground network in support of the flight. NASA and industry people who have learned of the amateur community's intentions are truly amazed at the thought of an informal fellowship of communications hobbyists putting together such an ambitious network so quickly!

Packet and ROBOT—Successful QSOs

So far we have been talking about crew-tended operations only, real-time voice and packet QSOs with the crew. Packet ROBOT operations do not require crew attention except for activation and deactivation. The ROBOT will generally be activated during one of the crew-tended windows, then deactivated during the next one. This gives approximately twelve hours ON and twelve hours OFF for the ROBOT, with the operational period chosen to cover all the US passes.

In addition to the planned in-school communication sessions, it is hoped that WA4SIR will have time to make some generally unscheduled direct voice contacts. However, it is the packet radio capability on both missions that will make it possible for far more successful QSOs between amateurs and the shuttle than has been possible on any previous ham-in-space operations. The SAREX packet equipment can be left unattended. The new side window antenna, designed and built by volunteers at the Motorola Amateur Radio Club in Schaumburg, Illinois, can be left in place. The old antenna, which was mounted in one of the upper deck windows, had to be removed when the window was needed for visual observations or photography. The side windows are not normally used during the on-orbit portion of missions.

Table 1.
SAREX Voice/Packet Frequencies

	Transmit Freqs.	Receive Freqs.
Group 1	145.55 MHz	144.95 MHz
	"	144.91
	"	144.97
Group 2	145.51	144.91
	"	144.93
	"	144.99
Group 3	145.59	144.99
	"	144.95
Group 4	145.55	144.95
	"	144.70
	"	144.75
	"	144.80
	"	144.85

Table 2. QRZ or Heard List

WA4SIR-1>QRZ <UI>:
#3405-NE3H WB6GFJ K5RR KO5I WB3ILO N3ACL N3FWX WA3TSD W3ZM WA3USG WB3AXC N3GIY KE4TZ G3ZCZ KO4A WA3EPT KA3TUU WB3AFL WB3IMM N3AGG DB2OS DJ4ZC G2BVN 4Z4ZB G3RWL G3AAJ G3IOR JR1SWB JA1ANG W3HZU W3INK W3GXT N4QQ W3IWI W3IUI

Table 3.
QSL or Confirming Stations Worked List

WA4SIR-1>QSL <UI>:
NI3F/186 WB2TNL/185 KA3MJM/181 W3IUI/179 WB3AFL/177 NF3N/176 WA3EPT/175 N4QQ/174 WA4SIR/173 W3IWI/172

Table 4. Example of the Metabeacon

WA4SIR-1>QST <I S1 R0>:
Your ROBOT QSO will be automatically logged and you will receive a serial number for the QSO. Your successful QSO will be announced in the beacon addressed to QST. All stations heard by the ROBOT are announced by the beacon addressed to QRZ.

Shuttle Audio HF Relay Frequencies:

WA3NAN—Goddard Space Flight Center: 3.860, 7.185, 14.295, 147.45 MHz

W5RRR—Johnson Space Center: 3.840, 14.280, 146.64 MHz

W6VIO—JPL: 3.840, 21.280 MHz

The HK-21 TNC will be loaded with an upgraded version of SAREX ROBOT software. Successful testing of the updated flight TNC software, written by Howie Goldstein N2WX, was recently completed by W3IWI and others in the Washington area. Joe Kasser G3ZCZ, working with Ron WA4SIR, has configured a custom version of his LAN-LINK packet terminal program to run on the GRID computer.

ROBOT software has two main functions: 1. An automatic QSO machine capable of making a complete, "legal" QSO under computer control. 2. Beacons that tell who has been worked and heard, and which send information on shuttle activities.

Let's take a look at the ROBOT QSO machine. A minimum legal QSO can be defined as the two-way exchange of information with acknowledgment. Here's an example of a QSO between W3IWI and the SAREX ROBOT, WA4SIR-1, as seen on W3IWI's terminal screen. W3IWI types the connect command which is echoed back:

C WA4SIR-1

When a connect is established, these lines appear:

*** CONNECTED to WA4SIR-1
#191—Tnx QSO with the SAREX Shuttle "ROBOT" automatic QSO machine
*** DISCONNECTED

This exchange includes the legal elements of a QSO: The station connects with the ROBOT. In doing so, the station's callsign is transmitted to the ROBOT. By accepting the connection, the ROBOT acknowledges receipt of the information by sending back a unique serial number (#191).

The ROBOT must hear the station's ACK in order to declare the QSO "good" and to enter it into the log. If no ACK is received after a predetermined number of retries, the QSO is not entered into the log. The user knows he had a QSO because he receives a disconnect, and because his call is immediately placed in the QSL log. The ROBOT QSO machine is configured to work up to nine simultaneous connections.

The "Normal" Beacons

The SAREX software on the orbiter's TNC includes two or three beacons sent down at predetermined intervals, probably about every 2 minutes. First, the QRZ beacon lists the last 35 stations heard. An example of such a beacon packet is shown in Table 2. Each time a beacon is sent, a beacon serial number (#3405 in this case) identifies the epoch time to help in confirmation of SWL reports. When the list of 35 fills up, the oldest entry is dropped off the bottom to make way for a new entry. Next, the software sends a list of the last 15 stations worked and the QSO serial number for the contact as shown in Table 3.

The QRZ and QSL beacons may be accompanied by another beacon if desired. In this case the address is SAREX, but it could be anything, as shown below:

WA4SIR-1>SAREX <UI>:
Connect to WA4SIR-1 for a QSO with the SAREX ROBOT.

The Metabeacon

The software also includes a "Metabeacon" consisting of numbered "I" frames addressed to QST which are periodically sent out independent of the QSL/QRZ beacon. The Metabeacon is intended to transmit a longer, up to 1.7K, instructive text message. An example of the Metabeacon is shown in Table 4.

Perhaps it might illustrate how all of this

works by imagining that you are the ham astronaut aboard the shuttle *Columbia* on Mission STS-35. For the W3IWI QSO shown above, here is what would appear on the screen of the GRID laptop.

*** CONNECTED to W3IWI
*** W3IWI QSO confirmed #191
*** DISCONNECTED

The QSL "worked" log is kept in the HK-21 TNC's RAM. Up to 650 entries can be listed, and the list is retained even when the power is shut off. The log lists only unique contacts. If you work the ROBOT more than once, only the first contact is logged, even though you will be given a unique serial number for the later QSOs. The log ignores your SSID, so a contact from K9DOG-1 made after a K9DOG QSO is considered a dupe. The TNC's 650 entry list should last for most of the mission, but it is anticipated that Ron will dump the log once or twice per day to the GRID laptop.

Joe Kasser G3ZCZ has set up LAN-LINK software for the space segment on the GRID PC which will automate most of the functions Ron will need in order to set up the TNC, load the beacons, save the logs, etc. LAN-LINK has a number of features designed especially for ground stations trying to work the SAREX, copy telemetry from the Microsats, and other special activities. (See the Packet Talk column on p. 58 for a description of LAN-LINK.)

QSLs

QSLs—the culmination of a successful and sought after QSO. This aspect of amateur radio has not been forgotten. Cards for stations who have successful QSOs with the Shuttle will be made out automatically based on the QSL "worked" log described above.

SWL cards for people who are heard by the SAREX ROBOT must be handled differently. The TNC simply does not have enough on-board RAM to retain a heard list any longer than 35 entries; the QRZ beacon will send the entire heard list every minute or two, along with the beacon serial number. Anyone wanting an SWL card will have to send a hard-copy listing of the QRZ in which their call appears, complete with the beacon serial number. Or they can send in the whole packet with the header as captured, via packet radio to a collection point to be announced. More detailed procedures will be announced later.

Information Dissemination

Dissemination of shuttle information will be via a system of key stations, namely WA3NAN at the Goddard Spaceflight Center Amateur Radio Club in Greenbelt, Maryland; W5RRR at JSC in Houston; and W6VIO at JPL in Pasadena, California. These stations will operate on HF and VHF 24 hours a day, carrying official NASA supplied voice communication between Mission Control in Houston and the shuttle crew. Amateur volunteers at JSC will feed further information via a computer network to these stations and others, including W1AW.

Updates and operating schedules will also be announced during the weekly AMSAT nets on 3.840 MHz every Tuesday evening (9 PM Eastern, 9 PM Central and 8 PM Pacific time). AMSAT nets are also held each Saturday at 1900Z on 14.282 MHz and at 2300Z on 18.155 MHz. Bulletins will appear on packet BBSs worldwide as well as W1AW transmissions. The Metabeacon may also be used for announcements. Those of you with satellite TVRO systems can watch continuous live coverage of the mission via NASA Select on SATCOM F-2, channel 13. NASA will be highlighting some of the ham-in-space activities via this satellite feed. Also, various ATV groups are planning to retransmit this signal (see the ATV column in this issue). If you'd like to help relay shuttle audio or video into the classroom, please contact Rosalie White at ARRL Headquarters (225 Main St., Newington CT 06111) for a SAREX school information package.

Another Opportunity

Ham-in-space fortunes took another jump when Shuttle Pilot Ken Cameron secured his license and the call KB5AWP. Ken is scheduled to fly on STS-37. Another joint ARRL/AMSAT letter proposing amateur operation on this flight went to NASA Headquarters and was accepted, so plans are underway for yet another SAREX. This time, it appears that there will be room for the entire package, including two-way SSTV (as on the STS-51F mission) as well as voice and packet.

Plans also call for an FSTV uplink experiment. The Amateur Radio Club at Motorola is providing most of the equipment. The new antenna, also made by this group, includes provisions for receiving 70cm ATV signals. Successfully receiving FSTV aboard the shuttle would be a first; although NASA has downlinked hours of FSTV, they have yet to uplink it.

Link calculations are not encouraging, but some dedicated groups across the southern part of the country, where shuttle coverage will be best, plan to expend maximum effort. If they can receive at least a few minutes of acceptable color video, the experiment will be considered a success, and score a first for amateur radio. The SAREX configuration slated for STS-37 is shown in Figure 2.

Current Status

Current plans for STS-35 call for SAREX to carry the Motorola HT used previously, plus a small packet radio TNC (a modified Heath/Tasco HK-21 "pocket packet") and the side window mounted antenna from the Motorola ARC. The TNC will be used with one of the PGSC GRID MD-DOS laptop computers now carried in the orbiter. STS-37 is to include the same functions, plus two-way SSTV capability and the FSTV uplink experiment.

Equipment and software are ready for both STS-35 and STS-37. Flight dates are currently May 9, 1990 for STS-35 and November 1, 1990 for STS-37. These dates represent changes from the previously announced dates of April 26 for STS-35 and June 4 for STS-37. *Excerpted from the AMSAT Journal.*

Bill Tynan W3XO, contact person for this article, may be reached at HCR5 Box 574-336, Kerrville TX 78028.

STS-35 Operating Schedule

All times are in Mission Elapsed Time (MET). MET is calculated from liftoff time. Example: 24 hours after liftoff would be represented as Day 1 0000 MET...Current plans are for liftoff on May 9 at 0447 UTC.

ROBOT Packet

Day 0	2200 MET	—	Day 1	1020 MET
Day 1	2115 MET	—	Day 2	0835 MET
Day 2	2000 MET	—	Day 3	0755 MET
Day 3	1900 MET	—	Day 4	0640 MET
Day 4	1830 MET	—	Day 5	0545 MET
Day 5	1720 MET	—	Day 6	0550 MET
Day 6	1740 MET	—	Day 7	0535 MET
Day 7	1745 MET	—	Day 8	0445 MET

Realtime Voice/Packet Opportunities

(Ron may operate "live" within these time windows.)

Day 0	1900	—	2145 MET
Day 1	1020	—	1200 MET
Day 1	2000	—	2115 MET
Day 2	0840	—	1030 MET
Day 2	1830	—	2000 MET
Day 3	0755	—	0930 MET
Day 3	1730	—	1900 MET
Day 4	0640	—	0830 MET
Day 4	1630	—	1815 MET
Day 5	0545	—	0800 MET
*Day 5	1600	—	1730 MET
Day 6	0550	—	0800 MET
*Day 6	1600	—	1730 MET
Day 7	1500	—	1750 MET
Day 8	0445	—	0615 MET

***Special "Astronomy Lesson from Space"...This will be carried on the NASA Select Satellite feed to interactive classrooms at Goddard Space Flight Center in Greenbelt, Maryland, as well as Marshall Space Center in Huntsville, Alabama. This is a great opportunity for hams to relay this session into classrooms via voice and ATV links to involve as many schools as possible!**

New Low Price!
Amateur Net $129.95*
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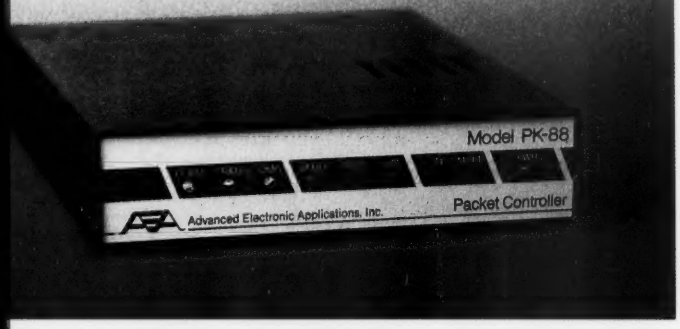
AEA's PK-88™ Packet Controller



Unique operating features with a proven hardware and software design make AEA's PK-88 your best choice in packet radio - now with MailDrop, an 8KBytes efficient personal Mailbox. The MailDrop uses a subset of the well-known WØRLI/WA7MBL packet BBS commands. When your PK-88 MailDrop is active, other stations can connect to your PK-88, leave messages for you or read messages from you. You can also store a single message or up to 15 separately numbered messages. Your MailDrop also accepts inbound mail forwarding from your local WØRLI/WA7MBL auto-forwarding packet BBSs.

The PK-88's internal KISS Mode is your direct interface to KA9Q's "NET" TCP/IP protocol suite - a single KISS command presets all packet parameters for TCP/IP operation. AEA's unique Host Mode provides the type of complete interface protocol preferred by many professional programmers for efficient control of the PK-88 by external programs and special applications. Your PK-88 also accepts special "NET/ROM" EPROMs provided by Software 2000, Inc., for Level Three node operation and networking.

In addition to all the features of a "standard" TNC, the PK-88 offers features not found in any other TNC:

- WHYNOT command - Shows reasons why some received packets are not displayed.
- "Packet Dump Suppression" - Prevents dumping unsent packets on the radio channel when the link fails.
- CUSTOM command - Allows limited PK-88 customization for non-standard applications.
- Enhanced MBX command - Permits display of the data in I- and UI-frames, without packet headers and without retries and repeats.
- Enhanced MPROTO command - Suppresses display of non-ASCII packets from Level Three switches and network nodes.
- Unique MFILTER value $80 - Suppresses all graphics and control characters except TAB, CR and LF.
- Unique DFROM command - Permits selective digipeating ("Accept" or "Reject" digipeater operation by call signs).

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- Input Sensitivity: 5 millivolts RMS
- Input Range: 5 to 770 millivolts RMS
- External Modem Connector for use with external modem
- Hardware Watchdog Timer: One-minute time-out

Rear Panel Input/Output Connections:

- Radio Interface: Locking eight-pin; Receive Audio, Transmit Audio, PTT, Auxiliary Squelch, Ground
- Audio Input/Output: 3.5mm mini-plug
- External Modem: Five pins on DB-25; Transmit Data, Receive Data, Data Carrier Detect, Clock, Ground
- Terminal Interface: Standard RS-232 25-pin DB-25 connector
- Terminal Data Rates: Autobaud settings at 300, 1200, 2400, 4800, 9600. TBAUD adds 45, 50, 57, 75, 100, 110, 150, 200, 400, 600 and 19,200 BPS terminal rates
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73 Review by Jim Eagleson WB6JNN/9

PLAN 13

Tracking Software for OSCAR 13.

Project OSCAR
(for C-64 and IBM)
PO Box 1136
Los Altos CA 94023-1136
Price Class: $30

Molniya orbit satellites, such as OSCAR 10 and OSCAR 13, provide excellent coverage of a wide area of the earth when they reach the highest point in their orbit. Unlike geosynchronous satellites, however, they do not remain at a fixed point in the sky, but are constantly changing in height above the earth (altitude), compass direction (azimuth), and angle above the horizon (elevation).

Pointing Your Antenna

Fortunately, during a large part of each orbit the satellite appears to remain in a relatively stable position, moving only 10–20 degrees in azimuth or elevation per hour. This simplifies tracking considerably. Some people, in fact, have successfully hand-pointed antennas while using both OSCAR 10 and 13.

Of course, it is quite easy to peak up your antenna on Phase III satellites by merely tuning to the beacon and adjusting your rotors until you get the strongest signal. Unlike earlier, low-earth orbit (LEO) satellites, Phase III elliptical orbits give you hours, not minutes, in which to adjust your antennas.

It is even easier to find and use one of these satellites if you already have some idea where it is supposed to be, what time it will be turned on, what mode it will be in, and whether its position is effective for you to communicate with a given station, area, or country.

A number of computer programs have been developed to keep track of OSCAR satellites. AMSAT-NA has a number of such programs for the more commonly used personal computers. Independent authors also offer satellite tracking programs.

Enter PLAN 13

PLAN 13 is a bit different from many of the other programs available. It not only provides the usual azimuth, elevation, distance, mode and time information, but also provides the user with the angle between where the spacecraft's antenna is aimed and the user's location.

The program was developed in Great Britain by Jim Miller G3RUH. It's the direct descendant of PLAN 10, an OSCAR 10 based program offered earlier through AMSAT-UK and Project OSCAR.

PLAN 13 is one of the less expensive programs available because it provides tracking data only. It has no fancy map display, ground track, coverage circles, and so forth. If you want these features, you should consider AMSAT's QUIKTRAK or Instant Track (IBM), or the popular VR-85 tracking program (C-64).

The "Squint" Angle

On the other hand, PLAN 13 provides what G3RUH calls the "squint" angle for the satellite. Keep in mind that in a Molniya orbit, a satellite changes position relative to any given location, and there are many times when the spacecraft's directional antennas are not aimed directly at you. The angle off "dead center" between where the satellite is pointed and where you are located is the "squint" angle. It could be anything from 0 to 360 degrees, but is normally less than 60 degrees during most parts of an orbit.

Knowing the squint angle provides you with a way to estimate just how much so-called "spin modulation" to expect, and whether you need to use more or less power for your uplink. These both depend on how far off dead center you are with respect to the satellite's main beam pattern. This is especially true when using Mode L (1269 MHz) since the beam width on this higher gain uplink is narrower than for other uplinks.

With OSCAR 13, "squint" angles greater than about 20 degrees produce fairly deep nulls in the pattern. While these nulls are not readily apparent when using SSB since many will fall during pauses in speech, they are quite noticeable on the beacon or on stations located on the fringes of the satellite's coverage area. This is why you may hear "local" stations (say, in the continental US) with very little "spin modulation," but Japanese, Australian, or European stations may show considerable nulling. The nulling in this case is occurring on the uplink from the DX station to the satellite since signals from other, relatively local stations are unaffected.

Modifying PLAN 13

A BASIC version of PLAN 13 is available for both the C-64 and IBM. You can modify the PLAN to predict what a given path will be like, and you can modify it to suit other needs.

You could, for example, set up a subroutine to compare two or more locations for mutual windows with minimum "spin modulation." Or, you might be more interested in finding access times which are most convenient for you and someone else in a different time zone. This could be important for repeater linking experiments, for example. Identifying periods of minimum "spin modulation" might be your goal for packet, RTTY, or SSTV operations since each of these modes are more sensitive than voice signals to data lost during fades.

You might decide that your personal schedule only allows you to use the satellite for a few minutes sometime between 6–11 PM. You would want to modify the program to report only information about orbits occurring during those hours. You could also add a subroutine to identify Saturdays and Sundays so that you could open up the time window on those two days.

You might only be interested in Mode "B" or Mode "JL" or Mode "S" orbits so that you would set up the program to report only periods during which those modes are active.

PLAN 13 is liberally sprinkled with REM statements so that anyone reasonably skilled in BASIC programming should be able to customize the program. Project OSCAR will be running any program modifications in their Project OSCAR newsletter from time to time.

Information Input and Output

Both the IBM and Commodore versions use separate files to keep station data and Keplerian information. These are called from within the IBM program, but are provided in separate programs for the C-64. The Keplerian data required is the usual information published by A

```
SAMPLE PRINTOUTS

IBM

OSCAR 13 - WB6JNN/9        AMSAT DAY: 4036      1989 Jan 19 (thu)

Orbit:3626   AP: 197   RAAN: 224   ALON/ALAT: 180/0   Ill: 97%
 UTC     MA   MODE  RANGE    EL     AZ     SD      UMD    ECL?   HGT     SLAT    SLON
01:45    224    B    22222     0    333     43     3.51     -    16743     54     140

COMMODORE 64

                OSCAR-13 FOR:- WB6JNN

STARTING AT 0000 UTC 19 / 1 / 89

S/CRAFT ATTITUDE USED ON THIS PRINTOUT IS:- LAT= 1  LON= 180

 DAY# 19     ORBIT# 450      ILL: 97%   SOLAR EL:-73 DEGREES

DAY    DATE     HH:MM   AZ    EL    SD     MA     RANGE    UMD    ECL    MODE
THU 19/01/89  01:45    333     1    46    226    21139    3.37     -       B
```

PLAN 13 printouts for the IBM-XT and the C-64.

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APRIL 1990 **APRIL 1990**

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Amateur Electronic Supply—Orlando, FL
Amateur Electronic Supply—Clearwater, FL
Amateur Electronic Supply—Las Vegas, NV
Austin Amateur Radio Supply—Austin, TX
Burghardt Amateur Center—Watertown, SD
Colorado Comm. Center—Denver, CO
Delaware Amateur Supply—New Castle, DE
El Original Electronics—Brownsville, TX
Electro-Com—Tacoma, WA
EEB—Vienna, VA
Ericson Communications—Chicago, IL
F & M Electronics—Greensboro, NC
Floyd Electronics—Collinsville, IL
The Ham Station—Evansville, IN
The Ham Hut—Amarillo, TX
Henry Radio—Los Angeles, CA
Hirsch Sales Co.—Williamsville, NY
HR Electronics—Muskegan, MI
Ham Radio Outlet—Anaheim, CA
Ham Radio Outlet—Atlanta, GA
Ham Radio Outlet—Burlingame, CA
Ham Radio Outlet—Oakland, CA
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KComm—San Antonio, TX
KJI Electronics—Cedar Grove, NJ
Madison Electronics—Houston, TX
Maryland Radio Center—Laurel, MD
Memphis Amateur Electronics—Memphis, TN
Michigan Radio—Mt. Clemens, MI
Missouri Radio Center—Kansas City, MO
N & G Electronics—Miami,FL
Omar Electronics—Loganville, GA
Omni Electronics—Laredo, TX
Quement Electronics—San Jose, CA
RF Enterprises—Merrifield, MN
R & L Electronics—Hamilton, OH
Radio World—Boulder City, NV
Reno Radio—Reno, NV
Rivendell Associates—Derry, NH
Rogus Electronics—Southington, CT
Rosen's Electronics—Williamson, WV
Ross Distributing Co.—Preston, ID
Satellite City—Minneapolis, MN
Soundnorth—S. Int'l Falls, MN
Tel-Comm Electronic Comm.—Littleton, MA
Texas Towers—Plano, TX
Universal Amateur Radio—Columbus, OH
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Texpro Sales Inc.—Burlington, Ontario
(416) 332-5944

CIRCLE 67 ON READER SERVICE CARD

MSAT-NA on their nets via packet radio and other sources.

In either case, the following station data is required:

Field	Example
1. CALLSIGN	WB6JNN/9
2. LATITUDE	43.10 (Decimal)
3. LONGITUDE	88.34 (Decimal)
4. STATION HEIGHT	333 (Meters)

Documentation for the IBM is included as a file on the disk. You can view it on screen by entering TYPE PLAN13.DOC or print it out with PRINT PLAN13.DOC.

I did not receive documentation for the C-64 version, though I would expect it will be included in the package for purchasers.

Naturally, the IBM version used on an AT Compatible (10 MHz) runs fastest. The uncompiled C-64 BASIC version runs slowest.

I ran a printout in draft quality mode for one day's orbit with the following results:

IBM-AT with EPSON FX-86e printer	25 sec
C-64 with STAR SL-10C printer (BLITZ!)	6 min 00 sec
C-64 with STAR SL-10C printer (BASIC 64)	3 min 00 sec
C-64 screen only (no printer) (BASIC)	6 min 00 sec
C-64 screen only (no printer) (BLITZ!)	2 min 35 sec
64 screen only (no printer) (BASIC 64)	1 min 15 sec

Those using IBM-XT's or PC's will fall somewhere between the C-64 screen-only speeds and the IBM-AT speed. *Blitz!* is the compiler used on the Project OSCAR disk.

"PLAN 13 is liberally sprinkled with REM statements (for easy customizing)."

Using the ABACUS BASIC-64 compiler, I generated a new program file with the noted results. When printing, much of the speed depends on the buffering capacity and character rate per second. Both the EPSON and STAR printers have at least 2K buffers and 100 cps printing speed in draft mode.

It is impossible to read a full day's output on the IBM screen when the printer is not being used, since it scrolls by too fast. CTRL-S and SCROLL LOCK wouldn't stop the scrolling, and no instructions are provided about how to do this.

You will note that the C-64 printout uses the European/Canadian date form (DD/MM/YY) after giving the Day of the Week rather than the more familiar MM/DD/YY.

The IBM version provides Satellite Latitude (SLAT) and Satellite Longitude (SLON) as well as Height above the earth. The C-64 version, while calculating this information internally, does not print it out (it puts the Day of Week and Date on each line, instead). See the figure.

Furthering the Amateur Satellite Program

PLAN 13 provides a good tracking program with the special feature of providing "squint" angle information. Also, anyone with moderate BASIC programming skills can customize it for special uses. It is one of the least expensive tracking programs available, and all proceeds after expenses go towards furthering the Amateur Satellite Program.

Upgrades to PLAN-13 for PLAN-10 owners are also available for a $5.00 donation. You must, however, send in your ORIGINAL PLAN-10 diskette and a return mailing label.

Project OSCAR has also announced a new program called Mutual Windows. This program provides many of the features suggested earlier in this article as possible customizing options. In addition, Squintplan is available for the IBM PC which combines PLAN-13 and Windows. All programs are $30 each. Send a SASE to Project OSCAR for details. 73

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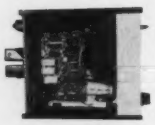

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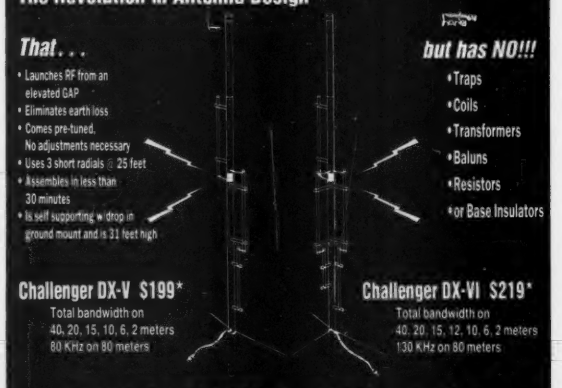

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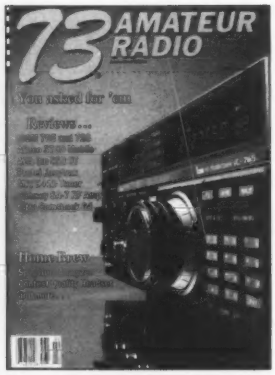

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The Payoff: Each month we'll draw a card at random. If yours is picked, you'll receive a one-year subscription (or extension) to *73*.

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Do we really read the feedback cards? You bet! The results are tabulated each month, and the editors take a good, hard look at what you do and don't like. To show our appreciation, we draw one feedback card each month and award the lucky winner a free one-year subscription (or extension) to *73*.

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1	Letters
2	Never Say Die
3	QRX
4	SAREX-90
5	Review: PLAN 13
6	Ham Profiles
7	Sharing the Adventure
8	Carole Perry WB2MGP
9	The Biggest Ham Country
10	Home-Brew: Wideband Preamp
11	Review: Cushcraft D3W
12	Looking West
13	"Say no to drugs"
14	Hamsats
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HAM PROFILES

There are no "average" hams!

Photo A. Ronald A. Parise, Ph.D., WA4SIR, Payload Specialist for Astro-1.

Reaching for the Stars

Astronaut Ronald A. Parise WA4SIR enjoys experimenting with hardware. He has been involved in flight, communications, and electronic systems design and development. Currently, he's on the research team for the Ultraviolet Imaging Telescope, and he's pursuing his astronomical interests with the International Ultraviolet Explorer satellite.

When he was 11 years-old, WA4SIR was "bitten" by the ham radio bug. He and a friend went to visit a local ham and he obtained his license the same year.

Dr. Parise is a payload specialist in training to operate experiments aboard Astro, a series of Spacelab astronomy missions. Payload specialists are usually scientists selected for particular Spacelab missions. The UV Telescope will be one of the instruments on board the Astro payload.

Besides astronomy and amateur radio, Dr. Parise enjoys flying, scuba diving, sailing, hiking, and camping.

At home in Silver Spring, Maryland, Dr. Parise is a senior scientist in the Space Observatories Department, Computer Sciences Corporation, where he works with the team on the UV Imaging Telescope.

Is amateur radio valuable in education for young people? "Absolutely." One of the reasons it's valuable, WA4SIR emphasized, is the hands-on nature of the hobby.

Fascinated with Electronics

Lt. Col. Kenneth D. Cameron KB5AWP became an astronaut with NASA in June 1985. He's currently assigned as a Capsule Communicator (CAPCOM), and he's in flight training as the pilot on the crew of STS-37. This mission will feature the deployment of the Gamma Ray Observatory for the purpose of exploring gamma ray sources throughout the universe.

Ken KB5AWP has logged over 2,700 hours flying time in 46 different types of aircraft. Flying heads the list of his recreational interests, followed by athletics, hunting, fishing, woodworking, reading and, of course, amateur radio.

KB5AWP enlisted in the Marines in 1969 and earned his Naval Aviator Wings in 1973, after receiving many special honors and commendations. A Vietnam veteran, he served as a Platoon Commander, and later with the Marine Security Guards at the US Embassy in Saigon. After obtaining his masters in aeronautics and astronautics at the Massachusetts Institute of Technology in 1979, he became a test pilot.

Photo B. Lt. Col. Kenneth D. Cameron KB5AWP, Capsule Communicator (CAPCOM), and pilot on the crew of STS-37.

Ken Cameron obtained his amateur radio operator's license in 1986. He's always been fascinated with electrical engineering and has found that his experiences in amateur radio really helped him learn and enjoy the practical application of electronics. He enjoys kit-building, and the challenge of QRP (low power) operation. A particular thrill was contacting his father, KB1WC in Connecticut, on 40 meters using just 1 watt from Houston. Ken has been instrumental in convincing his fellow astronauts to obtain their ham tickets. Through his efforts, we may see even more hams in space.

Photo C. David Piotrowski KC6HJJ, the youngest ham in Tulare County.

Ham with Many Interests

Ten-year-old David Piotrowski KC6HJJ obtained his Novice license in October 1989. He is the youngest person in Tulare County to obtain his license. By the time this issue of *73* goes to the printer, David will probably have passed his Technician Class exam.

David became interested in amateur radio through his stepfather, Les Delmarter, who has been a ham for more than 20 years.

David is very active on 10 meters, and he likes DXing. He's worked about a dozen countries and 30 states. Every Friday afternoon, he checks in on the young person's net.

A straight-A, 5th grade student at Terra Bella Elementary School, David has a wide range of interests which include computers, literature, music, and sports. He is the youngest member of his school's marching band, and is working toward being a member of the honor band. *(Submitted by Les Delmarter WB6YIK.)*

Sharing the Adventure with Young People

Amateur radio can make a difference.

by Linda Reneau KA1UKM

Aboard the 36-foot, wind-powered *Agua Alegre*, Mary Duffield WA6KFA teaches young people ecology, sailing, navigation, and ham radio. Mary obtained her license in 1977, when the Lions Club presented her with a rig so that she could communicate internationally while sailing the Pacific for ecological topics to videotape. Since she got her license, amateur radio has taken over her life. It has also been the turning point in many of the children's lives. Now in her early 70s, Mary especially appreciates a good crew of youngsters to share the adventure with her.

Home base is Santa Cruz, California, where she teaches ham radio in the schools.

Photo A. Gwen Hadley, Linda Dupree, and Rachel Tomares point proudly to places in the world where they've made friends by ham radio. (Photo by Art Lee.)

Photo B. Astride the boom of the Agua Alegre, high school senior Todd Meyer talks to his global family. The crew is sailing into another harbor, where they will disembark to visit the local schools. (Photo by Home Power.)

Mary has taught hundreds of young people in the elementary and high school grades, and many of them have obtained their licenses. With her young ham crew, she sails from harbor to harbor, to visit schools along the coast. When Mary goes to a new school, she takes one girl and one boy, HTs in hand, and lets them demonstrate amateur radio to the class. Their enthusiasm is quickly communicated to the students. One of Mary's high school girls said, "I feel like we're stitching together the electronic nervous system of the future."

> ***". . . kids actually listening to DOVE sums up what my life has been all about to date!"***

A high school dropout, who later became one of Mary's best students, was told by his chemistry teacher that he would never be able to learn anything. Imagine the look on his former teacher's face when the boy showed up one day to demonstrate amateur radio to the class! "That story bears telling and retelling," says Mary.

Doing Real Work

Young people are hungry to "do something real," and Mary's kids have found a way to contribute through amateur radio. Mary encourages young people to take on the challenge of the Planetary Citizen—to begin taking care of the world and each other, to stop polluting and overconsuming the earth, and cease warring among ourselves. Just words? Not for Mary and her students.

One of their projects was to set up an international teleconference on water quality via ham radio and computer networks. Students in junior high and younger, from Scotland, West Germany, New York, Canada, Denmark, Japan, Washington DC, Arizona, and Santa Cruz participated. The Santa Cruz students sent water test kits to all these locations, then shared the results over the air, agreeing to help the school that had the worst water.

The students discovered that the water supply of the Freedom School on the Mohawk Indian reservation in Roosevelt Town, New

Photo C. Helmsman Zary Gusto practices his sailing and ham radio skills aboard the Agua Alegre. He expects to obtain his Novice license soon—by his eighth birthday! (Photo by Zanos.)

York, was contaminated with lead and PCBs. The pollution was so severe that it could be fatal to eat eight tomatoes all at once from the school garden. Since lead accumulates in the body, these children were being poisoned daily, every time they drank from the school water fountain.

Mary's children and others in the network deluged the airwaves, networks, and powers-that-be with their findings, and finally shamed the authorities into trucking clean water to the school. Now, Mary says, they've finally moved the children to a new school.

When kids make something real happen, they're appreciated for their contribution, and they can't help but feel good about themselves. By the time Mary's children finished this project, they were experts in water testing. They acquired this knowledge to save children from being poisoned, not to just get an "A" in chemistry class.

More Projects

During the earthquake last year, Mary and crew assisted with emergency communications. One of the students kept the ambulances in touch with each other. On one mobile expedition organized by high school senior Todd Meyers KB6VOQ, they bicycled to the lighthouses at Point Montara and Pigeon Point on the coast, and set up a ham station to send radiograms to American Youth Hostel guests all over the world. This spring, many newly planted trees will owe their lives to kids urging kids over the net to plant a tree on Earth Day.

Kids working together discover that whether you're ten or seventeen, what counts is what you know and what you can do, not how old you are. They develop a strong sense of camaraderie. Together they listened to high school students in Hamburg, West Germany, describe the threatening cloud cover two days after the Chernobnyl nuclear accident. They listened to the voices of frightened children in the Freedom School. Together, they've made friends with children their age in Mexico City who must already work to survive, and who worry about losing their jobs.

And they heard their messages of peace transmitted on 2 meters from DOVE, which Mary calls AMSAT's gift. "...kids actually listening to DOVE sums up what my life has been all about to date!" Mary had distributed a "Calling All Kids" flyer for DOVE in the libraries and received hundreds of messages. Kids aren't apathetic when they get the chance for action.

"Young people are hungry to 'do something real...'"

Wonderful People

Local hams, such as Ben Deovlet W6FEU from San Jose, California, have volunteered much time, energy, and even equipment. "Hams are wonderful people," Mary says. "They are the technological wing that has kept us flying."

As an example, Mary reports that a call for assistance brought three hams to the aid of Robbi Eschelman, who is building Discovery Museum, centered on telecommunications, in San Jose. In addition to their regular jobs, these hams are putting in many hours of work on the Discovery station. Robbi felt that the museum wouldn't be complete without a ham station. She doesn't have her ham license yet, but she's working on it.

Steve Roberts N4RVE, whose articles have appeared in *73*, is another of Mary's favorite hams. His book, *Computing Across America*, is standard class reading. Mary and her students sometimes read portions over the radio, such as "...now our neighborhood is thousands of miles across. We prowl it endlessly via satellite and bicycle—learning, teaching, sharing, growing...Moscow is only five keystrokes away...Iran, Nicaragua, and South America are clustered together just down the road..." (You can reach Steve at Nomadic Research Labs, PO Box 2390, Santa Cruz CA 95063.)

Mary was delighted when Steve showed up at a couple of her schools. He not only demonstrated his famous Winnebiko; he also showed the kids that it's possible to grow up and do what you really want to do and support yourself in the world doing it. Steve says, "There's a good chance that my future travels will involve a deliberate program of visiting schools and demonstrating this whole technomadic online communicating solar/human-powered lifestyle. It's a message kids need to hear before they assume that their only choices are the ones doled out by guidance counselors."

Amateur Radio in Education

As to ham radio education in the schools, Mary was emphatic. "We have to muscle our way in," she said in her warm, rich voice. When it comes to budgeting, the school board authorities first cut whatever it is that they don't understand. Often, that means amateur radio, and when it's cut from the budget, she volunteers to teach for free. "I'd rather be doing what I want to do, and live on a small pension, than take a job just for the money." The latest good news is that three local school boards have approved the proposal to give 5 credits to any student studying ham radio.

To find elmers for kids, Mary advises that you "get hams and kids together." Take them to club meetings and encourage them to talk about what they're studying, what they're interested in, and what they're having trouble with, and before you know it, one ham or another is helping the youngster. Ham radio turns "couch potatoes into active communicators," Mary says.

Mary, a life-credentialed General Secondary retired teacher, heads the Redwood Youth Foundation, a nonprofit "Peace through Communication" organization established in 1982. This organization sets up ham radio classes in local schools. To find out more, write Mary at 2355 Brommer Street #23, Santa Cruz CA 95062 or call (408) 462-0300.

A Guiding Quote

When Mary is tempted to give up her floating home, the *Agua Alegre* (Spanish for "Happy Water"), she thinks of these lines by Jack Anderson, the columnist: "Each generation, if it is to fulfill itself, must have a dream to inspire it and an adventure to ennoble it." To her, Steve Roberts exemplifies what Anderson meant. Mary's own life is a fine example, too. Says Steve, "Mary is quite a lady. If I still have energy and passion at her age, I'll consider myself very fortunate. She's one of those people who Makes a Difference (and you can quote me)." 73

An Interview with Carole Perry WB2MGP

Enriching the curriculum with ham radio.

by Mary Alestra KB2IGG

This interview with Carole Perry WB2MGP was conducted and taped at Intermediate School 72 in Staten Island, New York, for *The Ragchewer*. The *Ragchewer* is a newsletter published by Carole's ham radio students.

Mary: How many years have you been a ham radio operator, Mrs. Perry?

Carole: I got my license in 1975 while I was vice-president of an electronics manufacturing firm in New York.

Mary: What got you interested in ham radio?

Carole: Some of the engineers I worked with were hams. I always envied all the fun I would see them having with their radios. One day one of them told me it was too bad I could probably never get a license because, after all, I was a woman. That was enough motivation for me! Since then, I have always been especially sensitive to the intimidation of females to get into this hobby, be it self-imposed or otherwise.

Mary: As a student of yours, I'm thrilled to have gotten involved with your ham radio program. I know a lot of children would like to know how you began the program here at our school.

Carole: In 1980 when the electronics company I worked for relocated, they gave me some time to decide whether or not to move with them. I took the time to return to my first love, which was teaching. There was a temporary opening in the shop department in a local Intermediate School on Staten Island. The principal, Stanley Katzman, offered me the position for three months. I thought perhaps the youngsters would enjoy learning about my ham radio hobby. I convinced the principal to let me try it as a pilot program. Little did I know what I was getting into.

Not only did the students react enthusiastically to it; the parents wrote in, requesting that the course be given again. Each term the program expanded more and more, til I looked up one day, and it was nine years later.

Mary: Why do you think the parents are so supportive?

Carole: I always recommend that the children study at home with a parent. It doesn't take long for a parent to see the value of a program that captures their child's interest and reenforces skills in geography, science, math, social studies and language arts. The parents are always invited to take the license exam with their children. Each term we have moms, dads, and siblings taking the exam, too. It's a great opportunity for parents to study with their children and get into a hobby the whole family can enjoy together. I've received hundreds of testimonials from parents thanking me.

Photo A. Kids participating in the "CQ All Schools Net" on 28.303 MHz at 17:30 UTC, Tuesdays and Thursdays.

Photo B. Carole's students especially enjoy space projects.

Mary: How many children are in the program?

Carole: I have 11 classes every term with 35–49 students in each class. That means over 800 students a year are being exposed to a whole new world.

Mary: I remember that you told us that taking the FCC license exam is a privilege and has nothing to do with the grade we would get from you.

Carole: That's right, Mary. This curriculum is designed to be exciting and challenging to all students. Children have different backgrounds and abilities, and the license is not necessarily the goal for everyone. The main purpose of my course is to motivate children in all areas of the school's curricula via amateur radio.

Mary: I never realized how much I was learning about geography until I had been a ham for a few months. You were right when you told us how much fun it would be to locate a place on the map while the person was on the air talking to us. One of the most exciting experiences I ever had was when Father Mike EL2BX/9L1 came to visit us from Sierra Leone, Africa. I learned so much about that part of the world. My social studies teacher said he was very impressed with the reports and projects on Africa that the ham radio students did because of our 20m contact.

Carole: That social studies teacher has now done several projects with me. Students can learn more by speaking directly to a citizen of a country than they can from a textbook. Besides, it's more fun.

Mary: You've done so many exciting things because of your involvement with amateur radio. The classes always enjoy listening to you share you experiences. What would you say is the most exciting thing that ever happened to you in ham radio?

Carole: Mary, I've had many memorable experiences in ham radio. I would have to say, though, that our six-month project to prepare for contact with astronaut Tony England WØORE, who was on board the *Challenger* on August 1, 1985, is right at the top of the list. The whole involvement with our student body, the local ham clubs, and the community, breathed new life into our interest in space travel. The culmination was the reception of an SSTV picture from the shuttle onto our auditorium TV monitor. Parents and community are still talking about how exciting it was to be part of what we did.

Mary: You really had all of us jumping up and down in our seats when you described your experiences at Kennedy Space Center last April. We felt we were living a fantasy adventure with you.

Carole: Even though the launch of the Atlantis was cancelled 32 seconds before liftoff, it was a fabulous experience for me just to be there, within four miles of the launch pad. I relive the experience every time I share it with my classes. I tried to convey to the kids how much pride I felt in being an American and being able to witness such a spectacular event. It was because of my work with the children in ham radio that I was invited to attend the launch—once again demonstrating that anything is possible in this dynamic hobby.

Mary: I have to tell you, Mrs. Perry, that one of the reasons many of us got all excited about ham radio at the beginning was because we could feel how excited you were and still are about all the things you do with us. No one in your class thinks that you're here as a

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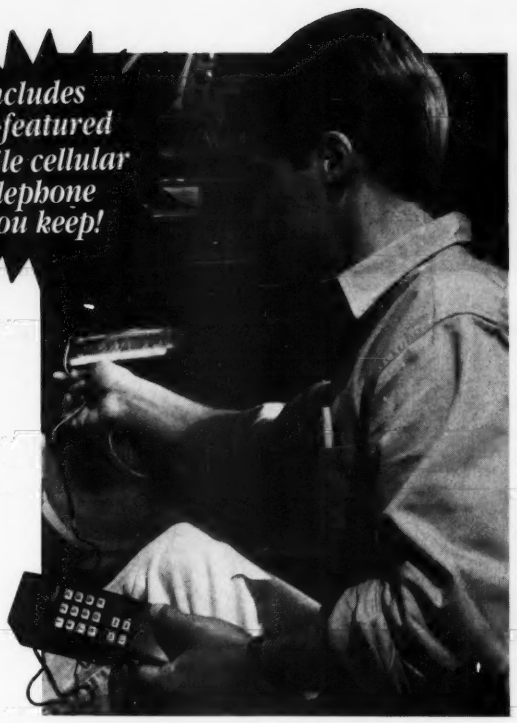

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__	QRP-80	29.95	VXO 80 Meter Transmitter Kit with 3.560 crystal "A"
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__	CA-AA	12.95	Case and Knob Kit for AA7 Active Antenna

"HR-" receivers are NE602-based direct-conversion for SSB, CW, RTTY reception.

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__	FR-10	29.95	Amateur 10 Meter FM Receiver Kit
__	FR-220	29.95	Amateur 1.25 Meter (220 Mhz.) FM Receiver Kit
__	CFR-7	12.95	Case and Knob Kit for FM Receiver Kits
__	SA-7	14.95	Broadband Preamp Kit (20 db. 100 KHz-1GHz.)
__	PR-10	17.95	Ham Two-Meter Preamp Kit
__	PR-20	17.95	220 MHz Preamp Kit
__	PR-40	17.95	440 MHz Preamp Kit
__	PA-10	69.95	Two-Meter Power Booster (wired & tested)
__	PA-20	69.95	220 MHz. Power Booster (wired & tested)
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__	MM-5	24.95	25-Tune MelodyMaker/3-Door Doorbell-Annunciator
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__	CSS-7	12.95	Speech Scrambler Case Kit
__	CT-127	29.95	Binary Thermometer Kit
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__	FM-4	12.95	High-Power FM Mike Kit
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__	FR-1	14.95	FM Receiver Kit (tunes approx. 70-130 MHz.)
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__	SM-3	3.95	Siren Kit
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__	MD-3	16.95	Microwave (1.3 Ghz.) Intrusion Alarm Kit
__	TS-1	6.95	Touch Switch Kit (makes 2 complete touch switches!)
__	TD-1	5.95	Tone Encoder-Decoder Kit
__	LB-5	9.95	Infra-Red Beam Communications Receiver Kit
__	LB-6	8.95	Infra-Red Beam Communications Transmitter Kit

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COM-7	3495.00	Spectrum Analyzer
RSG-10	2495.00	Synthesized Signal Generator

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CIRCLE 34 ON READER SERVICE CARD

"regular teacher." We all know how much you really love and enjoy getting us involved. Your enthusiasm is contagious. It's great to have a teacher get so excited about her work. When I was home ill last week, I made it a point to check in the "CQ All Schools Net" with you and Joe N6CRX.

Carole: Now you've touched upon a topic that's very special to me. Last year when Gordon West WB6NOA and I began the "CQ All Schools Net" on 28.303 MHz at 17:30 UTC on Tuesdays and Thursdays, we had no idea how well received it would be. It was obvious that the children in my classes were enjoying it tremendously. It soon became apparent that so were many other youngsters all over the country.

The purpose of the net is to stimulate an interest in young people to start communicating on the radio and open up all new experiences to them.

Hundreds of schools and youth groups have checked into the net to let us know how delighted they are with the exchanges we've been organizing. We have children in New York corresponding with school kids in California, Louisiana, Missouri, Nebraska, and many other places. We've exchanged video interviews so the youngsters get to see each other's classrooms and can get an idea of what schools look like in different parts of the country. Many of the children have become pen pals and exchange news clippings. We've spoken to students in a Los Angeles school the day after a recent earthquake. We've had nothing but exciting reports from other teachers, principals, and superintendents about these exchanges.

A big surprise to me was how many students were listening to us on shortwave radios. Many teachers wrote to me to find out how to pursue getting licensed so they could set up a ham shack in their rooms.

As a result of contacts on the net, we've had some fantastic visitors come to our school. There's something really exciting about meeting in person with someone who was just a voice on the radio.

We've had the privilege of playing host to handi-hams and QCWA members from all over the country. We've had hams come to our school with all different kinds of backgrounds to share with my children. Pilots, engineers, TV personalities, missionaries, dentists, scientists, travel agents, train conductors, teachers, and even a bird trainer, came to visit as a result of contacts. You never know who'll be getting back to you and what may come of the contact.

Mary: The ham radio room at our school has come to be a very special place to many students. Years later, former students return to visit a place where they were comfortable and had so much fun. During a recent reunion you organized with a local ham club, several former students came back to share with you how your ham radio program influenced their career choices and studies. You must feel very good about how you're able to influence so many youngsters with the ham radio program.

Carole: Mary, ham radio has had a tremendous influence on my life, and as a teacher, I am delighted to see how wonderfully children react to the exposure to ham radio. It's an incredible motivational tool in a classroom. By the way, Mary, I have never been more proud of any student than I am of you. You are an asset to amateur radio.

About Carole Perry WB2MGP

Carole Perry has been teaching "Introduction to Amateur Radio" at Intermediate School 72 in Staten Island, New York, for nine years. She created the curriculum currently being taught to 6th, 7th, and 8th graders.

Carole is the recipient of the prestigious 1987 Dayton Ham of the Year Award, the 1987 ARRL Professional Instructor of the Year Award, and the 1987 CONEX (QCWA Northeast Chapters) Teacher of the Year Award.

In April 1989, the NASA Education Department selected Carole to attend a special Educator's Conference and a VIP Viewing of the Space Shuttle *Atlantis*.

Carole is also an ARRL Assistant Director in the Hudson Division and Chairperson of the Hudson Division Educational Task Force. Presently, she serves on the National Education Committee of QCWA. In 1988, Carole was selected to be an Educational Advisor to the ARRL Education Department.

Carole has also created Media Mentor, Inc., to help and encourage other teachers to use ham radio to enrich students' knowledge of electronics, science, math, communications, geography, and other cultures. Her *Introduction to Amateur Radio* package includes twenty-six lesson plans, an audio cassette for code practice, a code practice oscillator, free videotape illustrating classroom instruction, and access to Ham Radio Hotline for customer support in using her package. For more information, write Carole Perry WB2MGP, Media Mentors, Inc., PO Box 131646, Staten Island NY 10313-0006 or call (718) 983–1416.

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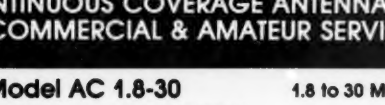

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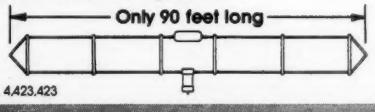

U.S. Patent No. 4,423,423

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CIRCLE 145 ON READER SERVICE CARD

The Biggest Ham Country—Japan

The how and why of the biggest ham boom on the planet.

by David Cowhig WA1LBP

Japan has 970,000 ham radio stations and about 1.5 million ham radio operators—double to triple the figures for the United States! Japan's ham population doubled between 1977 and 1987. The fourth class no-Morse-code requirement operator's license for radiotelephone privileges on all ham frequencies except 10 MHz and 14 MHz and the one-time lifetime operator licenses issued to Japanese ham radio enthusiasts are two big reasons for these phenomenal figures.

The great enthusiasm of the Japanese for electronics and for forming radio clubs that welcome prospective hams contributes enormously to the allure of ham radio in Japan.

Ham Heaven

Visitors to ham heaven in the Akihabara section of Tokyo know that they are on sacred ground. The variety of equipment and parts found there at affordable prices support Japan's legions of electronics enthusiasts. Wonderful ham magazines such as *Ham Journal* and *CQ Ham Radio*, a 500-page ham magazine in a telephone-book format (half advertising, half text) carry articles on home-brewing, DX, ham television, foxhunting (called foxtailing in Japan), the pleasures of communications across borders and language barriers using Morse code, the 9600 bps packet modem for the TNC-2 packet radio controller that does not require radio transceiver modification, live-tree antennas (the ultimate camouflaged antenna), and remote-controlled motor-driven transmatches for mobile operation. Other projects for the experimenter in recent issues of *CQ Ham Radio* include image communications using facsimile, videotex (NAPLPS), using electronic disk still cameras to record images for transmission, and slow-scan TV.

Most of Japan's million or so active hams, along with the rest of the country's 120 million people, live along the coast rather than in the mountainous interior. About 40 million people live within 50 miles of Tokyo. This great concentration of hams makes interference (QRM) a big problem, so the UHF and microwave bands carry a heavier load than in the USA. Beginners prefer the 144–146 MHz and especially the 430–440 MHz frequencies. Tokyo alone has more than 35 repeaters on 1200 MHz. Japan's ham clubs sponsor Field Day activities, transmitter hunts, all kinds of fun get-togethers, and the annual Ham Fair, one of the world's biggest ham-fests. These events inspire interest in ham radio. SWLs and other non-hams are welcome to participate in transmitter hunts. Awards for the best homemade ham equipment on that year's home-brew theme are presented every year at the Ham Fair. Combining backpacking in the mountains with operating on 144 MHz and 430 MHz is very popular.

Getting In

In Japan there are two routes into ham radio. The *Amateur Radio Guide* by JA1AYO tells us that prospective hams pass a test at the conclusion of a 47-hour course given by the Japan Amateur Radio League (JARL) to prepare for the fourth class or third class license.

About 60,000 people passed ham licensing examinations during 1988. A ham operator's license is valid for life but the station license must be renewed every five years, so some Japanese hams who use a club station rather than a personal station do not have their own

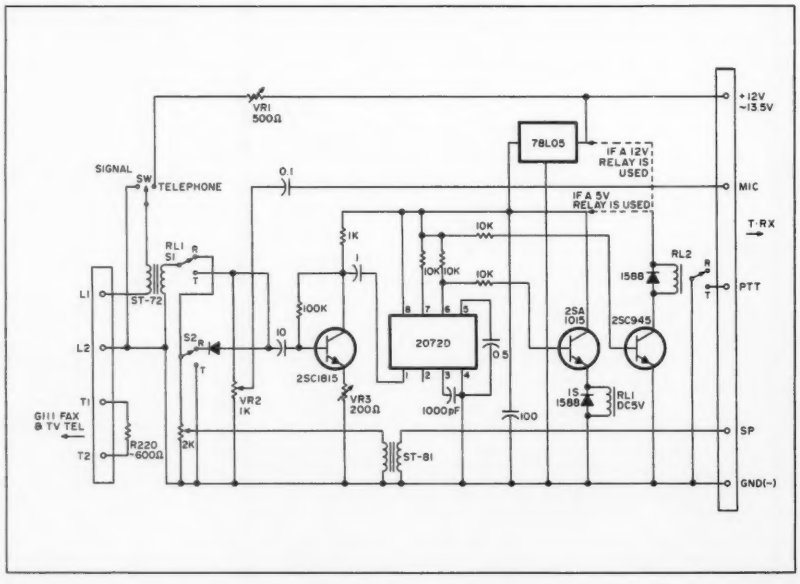

Figure 1. The JA8IJY G3 FAX controller for ham FAX. 1. Adjust 500 ohm variable resistor VR1 so that the voltage at terminals L1 and L2 will be 7 volts when off the hook (when FAX is in the connected state). 2. Value of resistor between T1 and T2: A resistance such that voltage at the start of the transmission will be 4.5–5 volts (when the FAX is connected). 3. VOX-GAIN: Use VR3 to adjust the gain. If transmission doesn't start when the gain is high, change the orientation of 1S1588. If it still doesn't work replace with a diode which has a lower DC resistance. 4. MIC-GAIN: Adjust VR2 to get the appropriate modulation level.

HF Equipment	Regular	SALE
IC-765 Xcvr/ps/keyer/auto tuner.....	3149.00	**2699**

IC-781 Xcvr/Rcvr/ps/tuner/scope	6149	**5295**

IC-751A 9-band xcvr/.1-30 MHz rcvr	1699.00	**1469**
PS-35 Internal power supply.....	219.00	**199**95
FL-63A 250 Hz CW filter (1st IF).....	59.00	
FL-52A 500 Hz CW filter (2nd IF).....	115.00	**109**95
FL-53A 250 Hz CW filter (2nd IF).....	115.00	**109**95
FL-70 2.8 kHz wide SSB filter.....	59.00	
RC-10 External frequency controller	49.00	

IC-735 HF xcvr/SW rcvr/mic *(Special)*	1149.00	**969**95
PS-55 External power supply	219.00	**199**95
AT-150 Automatic antenna tuner	445.00	**389**95
FL-32A 500 Hz CW filter.....	69.00	
EX-243 Electronic keyer unit.....	64.50	
UT-30 Tone encoder	18.50	
IC-725 HF xcvr/SW rcvr..... *(Special)*	949.00	**799**95
AH-3 Automatic ant tuner .. *(Special)*	489.00	**379**95
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IC-4KL HF 1KW out s/s amp w/ps.....	6995.00	**5995**
EX-627 HF auto. ant. selector *(Special)*	315.00	**269**95
PS-15 20A external power supply	175.00	**159**95
PS-30 Systems p/s w/cord, 6-pin plug	349.00	**319**95
SP-3 External speaker	65.00	
SP-7 Small external speaker	51.99	
CR-64 High stab. ref. xtal; 751A, etc ...	79.00	
PP-1 Speaker/patch.....	179.00	**169**95
SM-6 Desk microphone.....	47.95	
SM-8 Desk mic - two cables, scan	89.00	
AT-100 100W 8-band auto. ant. tuner ...	445.00	**389**95
AT-500 500W 9-band auto. ant. tuner ...	589.00	**519**95
AH-2 8-band tuner w/mount & whip	758.00	**689**95
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IC-475A 25w 440 FM/SSB/CW w/ps	1399.00	**1199**
IC-475H 100w 440 FM/SSB/CW *(Spec)*	1599.00	**1269**
IC-575A 25w 6/10m xcvr/ps *(Special)*	1399.00	**1099**
IC-575H 25w 100w 6/10m xcvr.....	1699.00	**1469**

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HM-14 Extra TTP microphone.....	59.00	
UT-28 Digital code squelch.....	39.50	
UT-29 Tone squelch decoder.....	39.50	
HM-16 Speaker/microphone.....	34.00	

IC-228A 25w 2m FM/TTP mic *(Special)*	509.00	**379**95
IC-228H 45w 2m FM/TTP scan *(Special)*	539.00	**419**95
IC-448A 25w 440 FM/TTP mic	599.00	**519**95
UT-40 Pocket beep function.....	45.00	
IC-900A Transceiver controller	639.00	**449**95

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UX-29A 2m, 25w band unit	299.00	**269**95
UX-29H 2m, 45w band unit	349.00	**319**95
UX-39A 220MHZ, 25w unit *(Special)*	349.00	**279**95
UX-59A 6m, 10w band unit	349.00	**319**95
UX-129A 1.2GHz 10w band unit.....	549.00	**499**95
IC-901 2m/440MHz xcvr ..... *(Special)*	1199.00	**929**95
IC-1200A 10w, 1.2GHz FM... *(Closeout)*	699.00	**589**95
IC-2500A 35w, 440/1.2GHz FM mobile	999.00	**869**95
IC-3210A 25w, 2m/440 FM.. *(Closeout)*	739.00	**499**95
IC-2400A 2m/440 FM/TTP ... *(Special)*	899.00	**699**95
AH-32 2m/440 Dual Band mobile ant	39.00	
AHB-32 Trunk-lip mount.....	35.00	
Larsen PO-K Roof mount	23.00	
Larsen PO-TLM Trunk-lip mount.....	24.70	
Larsen PO-MM Magnetic mount	28.75	
RP-1510 2m 25w repeater	1849.00	**1649**
RP-4020 440MHz 25w repeater	2299.00	**1999**

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IC-3SAT 220 HT/TTP	449.00	**399**95
IC-4SAT 440 HT/TTP	449.00	**399**95
IC-2GAT 2m HT/TTP	429.00	**379**95
IC-4GAT 440MHz, TTP	449.00	**389**95
Special . .		
IC-32AT 2m/440 HT	629.00	**539**95
IC-24AT 2m/440 HT	629.00	**549**95

IC-12AT 1.2GHz FM HT/TTP... *(Closeout)*	473.00	**349**95
IC-12GAT 1w 1.2GHz HT/batt/cgr/TTP	529.00	**469**95

Aircraft band handhelds	Regular	SALE
A-2 5W PEP synth. aircraft HT.....	525.00	**479**95
A-20 Synth. aircraft HT w/VOR.....	625.00	**549**95

For HT Accessories • CALL for Prices

Receivers	Regular	SALE
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RC-11 Infrared remote controller....	70.99	
FL-32A 500 Hz CW filter	69.00	
FL-63A 250 Hz CW filter (1st IF)	59.00	
FL-44A SSB filter (2nd IF).....	178.00	**159**95
EX-257 FM unit.....	49.00	
EX-310 Voice synthesizer	59.00	
CR-64 High stability oscillator xtal	79.00	
SP-3 External speaker.....	65.00	
CK-70 (EX-299) 12V DC option.....	12.99	
MB-12 Mobile mount	25.99	

R-7000 25MHz-2GHz receiver.....	1199.00	**1029**
RC-12 Infrared remote controller....	70.99	
EX-310 Voice synthesizer	59.00	
TV-R7000 ATV unit.....	139.00	**129**95
AH-7000 Radiating antenna	99.00	

R-9000 100KHz-2GHz all-mode rcvr ... 5459.00 **4699**

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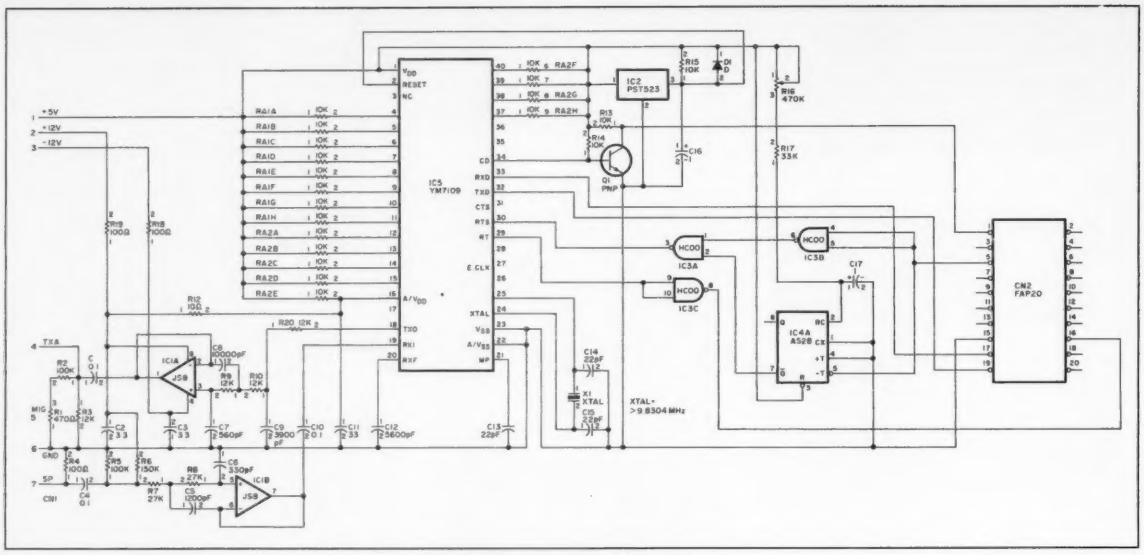

Figure 2. The PRUG V.29 9600 bps modem circuit.

callsigns. Candidates for the second class or first class license must pass a government test. Fourth class operators, about 1.2 million hams, can transmit up to 10 watts output on all frequencies except 10 MHz and 14 MHz and all modes except radiotelegraphy (Morse code). Third class operators, about 100,000 of Japan's hams, have the same frequency privileges but may operate all modes and can transmit up to 25 watts out since they have passed a 5 wpm Morse code test.

Second class operators, 50,000 of Japan's hams, pass a 9 wpm code test and a more difficult examination about electronics and radio theory, to win the privilege to transmit up to 100 watts output on all ham frequencies and modes. The first class operators, 13,000 of Japan's hams, pass a 12 wpm international Morse code test and a 10 word per minute test in Japanese Morse code. The Japanese Morse code is used to send messages using the Japanese syllabary, or "Kana." First class operators can use higher power on all amateur bands and modes.

Japan's 970,000 ham radio stations, which are about equal to the combined listing in the *North American Callbook* and the *DX Callbook*, are listed in the *Amateur Radio Station Callbook*. The two volumes of this callbook published by the JARL are about the size of a metropolitan telephone directory. Relatively few of Japan's fourth class operators move up to the higher classes. Many able Japanese hams find 10 watts on the VHF, UHF and microwave bands adequate and don't have space for big HF antennas, so they have little incentive to upgrade.

The large ham population supports several excellent ham magazines and spurs the development of great new ham equipment. Most of the HF transceivers sold in Japan are of the 10 watt variety. We see only the 100 watt versions over here.

Join in the Fun

We can learn from some of the interesting new modes and home-brew projects developed by Japanese hams. Exchanging videotex images by packet, a 9600 bps modem for the TNC-2 packet controller, 9600 bps facsimile by radio, and tree antennas are some of the exciting ham projects discussed in *CQ Ham Radio* during 1989.

Akihisa Kurashima (Roy) JM1VSP and several other Japanese hams and members of ASCII-NET have created MS-DOS North American Presentation Layer Protocol Syntax (NAPLPS, pronounced NAP-LIPS) videotex software for ham radio and BBS use. This software creates, puts in a convenient file transfer format, and displays either in real-time or from a saved file NAPLPS color videotex images on IBM compatible personal computers. A mouse-driven NAPLPS editor works on Japanese PCs but not on IBM PCs as yet, so creating videotex images takes some time. The work is worth the effort to learn about an interesting method for sending pictures, maps or other graphic data by our digital modes such as packet and RTTY.

Maybe one of you will write an MS-DOS version of the NAPLPS mouse-driven graphics editor so videotex packet can take off on this side of the Pacific. You can download NAPLPS software—NALPVIEW.ZIP, etc.—and sample videotex images from Japan from the *73* BBS at (603) 525–4438 or from the Virginia Connection, a 19,200 bps landline BBS at (703) 648–1841.

JA8IJY has developed a very simple, inexpensive method to put a telephone facsimile machine to work with your ham transceiver. The latest Group 3 facsimile machine calls use high speed digital transmissions at 9600 bits per second with fallbacks to 4800 bps and

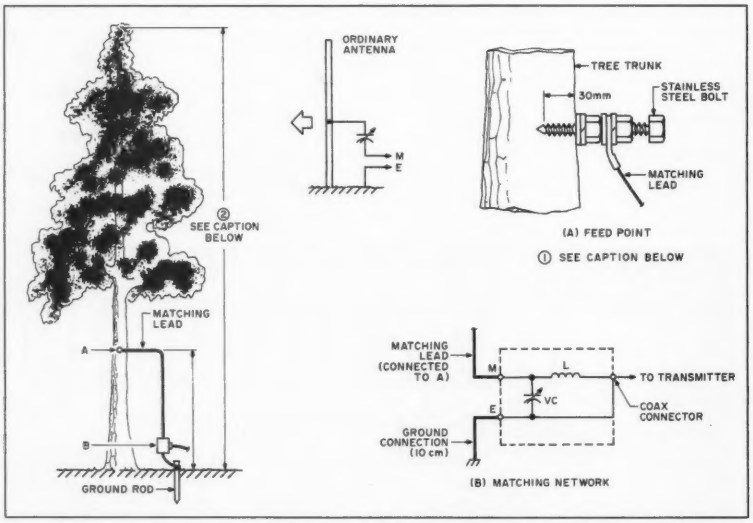

Figure 3. A tree antenna. 1. C: 70 pF 500 V variable capacitor, adjusted about halfway in; L: 0.9 µH coil. 2. Tree used is about 3.73 meters high, diameter at A is 12.5 cm; at B 16.6 cm.

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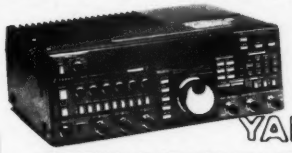

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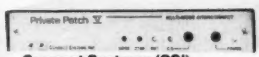

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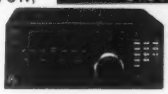

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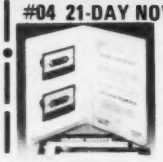

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2400 bps if line conditions are poor. Normal G3 resolution is 203 lines per inch horizontal and 98 lines per inch vertical. G3 facsimile machines have become very popular in homes and offices over the past year. A basic G3 telephone FAX costs about $500. G3 ham facsimile may become popular as the price of these machines drops further and used facsimile machines become available.

Mr. Fukunishi JA8IJY suggests using G3 facsimile with an HF SSB transceiver but using FM or SSB to transmit on VHF and UHF. JA8IJY's G3 FAX communication system does not require any modifications to an ordinary G3 facsimile machine. See Figure 1.

Higher On SSB Than On FM

JS1DCF and JL3OUW of the Packet Radio Users' Group (PRUG) in Japan described in *CQ Ham Radio* the PRUG 9600 bps modem for the TNC-2 packet controller that can be used with SSB and FM rigs without modification to the rig. Transmitting at 9600 bps transfers messages much faster than at 1200 bps, especially for long frames, but phase lags caused by fading or multiple path reception affect 9600 bps transmission much more severely. May 1989 experiments on 430 MHz SSB by JN1OLJ and JR2BNF show that 9600 bps packet on SSB is possible using some unmodified SSB transceivers such as the IC-735.

"Ham radio is a great tool for learning about foreign languages and cultures."

In the November 1989 issue of *CQ Ham Radio* JL3OLW describes this 9600 bps modem and modifications to the MFJ-1278 TNC to accommodate it. The Yamaha YM7109 9600 bps FAX modem chip used by this modem, like the 9600 bps FAX and land-line modems used widely today, operates at 2400 bps and uses the quadrature modulation technique to quadruple throughput to 9600 bps using the CITT V.29 standard. Using V.29, bit strings of four bits (which have 4 x 4 = 16 possible combinations) are sent as a unit by modulating a 1700 Hz subcarrier to produce eight different phase shifts and then using high and low amplitude signals to produce 16 different states (8 x 2 = 16). The modulation speed is one-fourth of 9600 bps, or 2400 bps. The subcarrier has sidebands which are one-half the modulation speed 1700±(2400/2). These sidebands in the 500–2900 Hz range fall within the 300 Hz–3 kHz range used in amateur voice communications that have an audio range of 300–3 kHz. With the release of this modem/TNC design and the availability of the G3RUH modem in Japan, 9600 bps packet stations are becoming much more common there. See Figure 2 for a circuit diagram of the PRUG 9600 bps modem.

Tree Antennas

The best concealed antennas are something else. JA6HW and JA6AUI described their experiments with live tree antennas in the May 1989 issue of *CQ Ham Radio*. Live tree antenna designs were discussed in *QST* and *Radio* during the 1930s and used by U.S. forces in Vietnam. JA6HW and JA6AUI describe a matching unit and the matching leads they used to load a 12 foot high tree on the 10 meter band. They worked stations in the US, Europe, Australia and Asia on 10 meter CW, SSB and FM with 50 watts to the tree. The SWR using the matching network was better than 1.3:1 across the entire 10 meter band. Measurements with an electrical field-strength meter showed that the tree, not the matching lead, was the radiator. Most of the radiation was vertically-polarized but horizontally-polarized radiation was stronger near horizontally-oriented leaves. They believe loading a tree using a toroidal coil around the tree trunk may be possible.

It's fun to experiment. See the details of their L network loading arrangement in Figure 3. Measure the DC resistance, impedance and resonant frequency between points M and E (across the matching network between the matching lead and ground). Using an impedance meter, they found a capacitive impedance of 400 ohms on their tree at 27.5 MHz, so they plugged into the standard formulas to match 400 ohms to the 50 ohm impedance of their coaxial cable. They could then find the proper values of the network capacitor and the inductor. You will have different values for the matching network and length of the matching lead according to the size of your tree antenna.

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Ham radio is a great tool for learning about foreign languages and cultures. As a nearly monolingual continental country, we in the USA need to better appreciate the great work being done overseas. Let's use ham radio to build friendships with hams in Japan and other countries. 73

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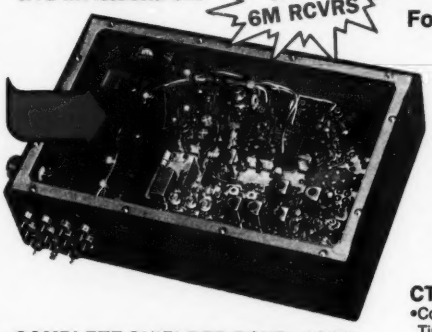

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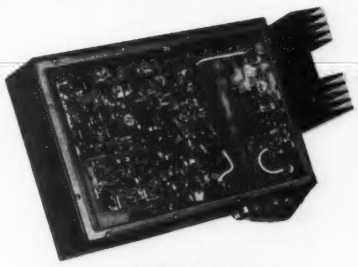

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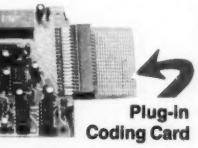

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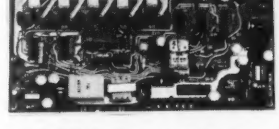

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- 0/1 inhibit bd. also available
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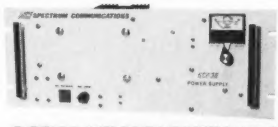

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- 30A @ 70% duty, 25A @ 100% duty.
- Massive 30 lb. Transformer & Heat Sinks.

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CIRCLE 51 ON READER SERVICE CARD

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(714) 458-7277

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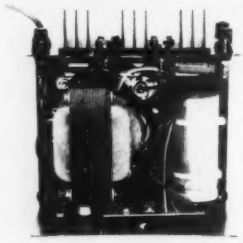


INSIDE VIEW — RS-12A

SPECIAL FEATURES

- SOLID STATE ELECTRONICALLY REGULATED
- FOLD-BACK CURRENT LIMITING Protects Power Supply from excessive current & continuous shorted output
- CROWBAR OVER VOLTAGE PROTECTION on all Models **except RS-3A, RS-4A, RS-5A.**
- MAINTAIN REGULATION & LOW RIPPLE at low line input Voltage
- HEAVY DUTY HEAT SINK • CHASSIS MOUNT FUSE
- THREE CONDUCTOR POWER CORD
- ONE YEAR WARRANTY • MADE IN U.S.A.

PERFORMANCE SPECIFICATIONS

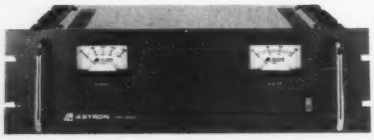
- INPUT VOLTAGE: 105-125 VAC
- OUTPUT VOLTAGE: 13.8 VDC ± 0.05 volts (Internally Adjustable: 11-15 VDC)
- RIPPLE Less than 5mv peak to peak (full load & low line)
- **Also available with 220 VAC input voltage**

MODEL RS-50A

MODEL RS-50M

MODEL VS-50M

RM SERIES



MODEL RM-35M

19″ × 5¼ RACK MOUNT POWER SUPPLIES

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RM-12A	9	12	5¼ × 19 × 8¼	16
RM-35A	25	35	5¼ × 19 × 12½	38
RM-50A	37	50	5¼ × 19 × 12½	50
• Separate Volt and Amp Meters				
RM-12M	9	12	5¼ × 19 × 8¼	16
RM-35M	25	35	5¼ × 19 × 12½	38
RM-50M	37	50	5¼ × 19 × 12½	50

RS-A SERIES

MODEL RS-7A

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-3A	2.5	3	3 × 4¾ × 5¾	4
RS-4A	3	4	3¾ × 6½ × 9	5
RS-5A	4	5	3½ × 6⅛ × 7¼	7
RS-7A	5	7	3¾ × 6½ × 9	9
RS-7B	5	7	4 × 7½ × 10¾	10
RS-10A	7.5	10	4 × 7½ × 10¾	11
RS-12A	9	12	4½ × 8 × 9	13
RS-12B	9	12	4 × 7½ × 10¾	13
RS-20A	16	20	5 × 9 × 10½	18
RS-35A	25	35	5 × 11 × 11	27
RS-50A	37	50	6 × 13¾ × 11	46

RS-M SERIES

MODEL RS-35M

MODEL	Continuous Duty (Amps)	ICS* (Amps)	Size (IN) H × W × D	Shipping Wt. (lbs.)
• Switchable volt and Amp meter				
RS-12M	9	12	4½ × 8 × 9	13
• Separate volt and Amp meters				
RS-20M	16	20	5 × 9 × 10½	18
RS-35M	25	35	5 × 11 × 11	27
RS-50M	37	50	6 × 13¾ × 11	46

VS-M AND VRM-M SERIES

MODEL VS-35M

• Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

MODEL	Continuous Duty (Amps) @13.8VDC	@10VDC	@5VDC	ICS* (Amps) @13.8V	Size (IN) H × W × D	Shipping Wt. (lbs.)
VS-12M	9	5	2	12	4½ × 8 × 9	13
VS-20M	16	9	4	20	5 × 9 × 10½	20
VS-35M	25	15	7	35	5 × 11 × 11	29
VS-50M	37	22	10	50	6 × 13¾ × 11	46
• Variable rack mount power supplies						
VRM-35M	25	15	7	35	5¼ × 19 × 12½	38
VRM-50M	37	22	10	50	5¼ × 19 × 12½	50

RS-S SERIES

MODEL RS-12S

• Built in speaker

MODEL	Continuous Duty (Amps)	ICS* Amps	Size (IN) H × W × D	Shipping Wt. (lbs.)
RS-7S	5	7	4 × 7½ × 10¾	10
RS-10S	7.5	10	4 × 7½ × 10¾	12
RS-12S	9	12	4½ × 8 × 9	13
RS-20S	16	20	5 × 9 × 10½	18

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

CIRCLE 16 ON READER SERVICE CARD

A Low-Cost Wideband Preamplifier

Using a versatile little Motorola IC.

by Bill Unger VE3EFC

Recently I was trying to do some low level RF measurements. I needed a preamplifier with a minimum of 20 dB gain and a bandwidth of several hundred MHz. I started to use discrete transistors and broadbanding techniques to build an amplifier but I quickly ran out of board space. Transistors, resistors, capacitors and toroids take up a lot of space. And I still didn't get the bandwidth that I'd hoped for!

The solution I found was a family of ICs by Motorola called "Wideband Amplifiers" (part numbers MWA110, MWA120 and MWA130). Their specifications are amazing considering they are three-pin devices in TO-39 cases. They have 14 dB of gain from 0.1 to 400 MHz and the input and output impedance is 50 ohms. The output power capabilities of the MWA110, 120 and 130 are −2.5, +8.2 and +18 dBm respectively. There are only three external parts required to make them operate.

Figure 1 is a schematic showing two of the amps cascaded. The coupling and bypass capacitors must have a low reactance at the operating frequency. I used 0.1 uF disk capacitors, however chip caps are recommended.

The value of the bias resistor is calculated using the formula:

Rb = Vcc − Vd / Id

Vcc = supply voltage

Vd = device operating voltage

Id = device operating current

Table 1 gives the values for Vd and Id. You can calculate the value of the bias resistor or you can use the values I have supplied. I suggest that you use a Vcc of 12 volts or greater. With lower voltages the bias resistor is small compared to the 50 ohm output impedance and the signal will want to get into the power supply instead of the next stage. Do not forget the bypass caps or the circuit will start to oscillate.

Figure 2 shows the circuit board layout and parts placement diagram. I scribed the outline on a piece of surplus double-sided PC board measuring 1 x 2-9/16 inches and then etched it out using a Dremel tool. The board is soldered directly to the RF connectors and mounted in a Hammond 1411C chassis to reduce lead length. The resulting board works well and takes just a few minutes to make. (The bottom side of the board is used as a ground plane.)

You can use this versatile little IC in many projects where an RF amplifier is called for. I have used it as a preamp for a direct conversion receiver and a frequency counter. It doesn't take up very much room so it's easy to install in existing equipment.

The Motorola MWA series is "second sourced" by many of the large semiconductor suppliers. If you have trouble finding it, browsing through the transistor repair manual at the local TV repair shop will probably get you a lead on the device. 73

Bill Unger VE3EFC has been licensed since 1970. He spends most of his time "melting solder" and building QRP rigs. He works as a network supervisor for TV Ontario. Contact him at 1272 Birchgrove Dr., Thunder Bay Ontario P7B 5E2 Canada.

Table 1.

	Vcc	Vd	Id	Rb
MWA110	5 Vdc	2.9 Vdc	10 mA	210Ω
	6			310Ω
	12			910Ω
MWA120	5	5.0	25	1Ω
	6			40Ω
	12			280Ω
MWA130	5	3.2	25	85Ω
	6			120Ω
	12			360Ω

Table 2. Wideband Preamplifier Cost Breakdown

Resistors	2 x 0.10	$0.20
Capacitors	5 x 0.50	$2.50
MWA110	6.00	$6.00
MWA120	7.00	$7.00
Chassis	4.00	$4.00
RF Connectors	2 x 3.00	$6.00
PC Board	2.00	$2.00
	Total	$27.70

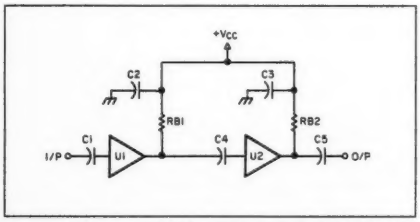


Figure 1. Vcc = 12 Vdc; C1 to C5 = 0.1 µF; RB1 = 910Ω; RB2 = 280Ω; U1 = MWA110; U2 = MWA120.

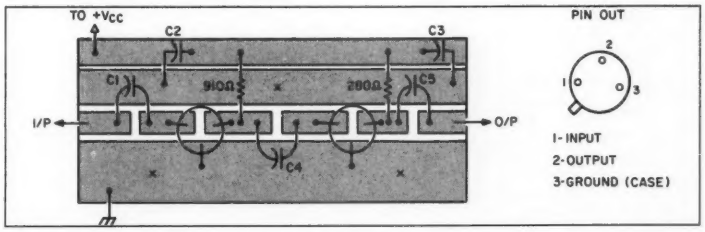


Figure 2. PC board layout (shading represents copper) and parts layout. "X" is the feedthrough wire to the ground plane. All capacitors are 0.1 µF. Keep all leads short.

73 Review

by Bill Clarke WA4BLC

The Cushcraft D3W

Rotatable dipole for the WARC bands.

Cushcraft Corporation
48 Perimeter Road
Box 4680
Manchester NH 03108
Tel. (603) 627-7877
Price Class: $200.

Recognizing the lack of antennas specifically designed for the WARC bands (30, 17, and 12 meters), Cushcraft has introduced a high quality, trapped tubular aluminum dipole.

The new antenna, the D3W (dipole 3-band WARC), physically resembles the driven element of a tribander. Although not providing the directional patterns of the latter, the D3W is an easy and rugged answer to the WARC band antenna problem.

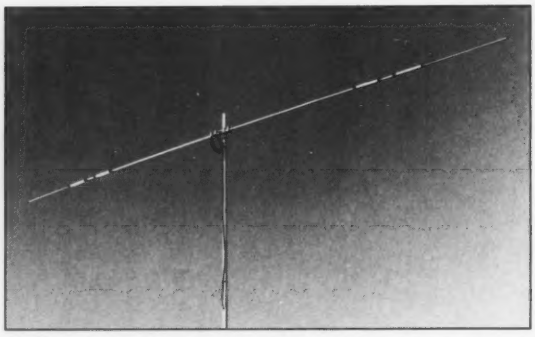


Photo A. The Cushcraft D3W Rotatable Dipole (photo courtesy of Cushcraft).

Assembly and Mounting

The antenna arrived in a box containing numerous tubular parts, traps, and assorted hardware in the exact quantity required for assembly.

Assembly was quick and easy, taking about two and a half hours. Careful element measurement is a must to ensure that the antenna will perform according to specifications.

The dipole offers little wind resistance. It weighs only 11 pounds, hence I put it on an old TV antenna rotator for directional control. This was mounted on a heavy duty push-up mast attached to the side of my house. I was correct in assuming that the D3W's size and weight would allow it to be mounted inexpensively. But one word of caution: When using a push-up mast, you must have structural support (such as the side of a building), or use proper guying techniques. Failure to heed this advice will result in possible injury and damaged equipment.

Performance on the Bands

The new antenna loaded well with good SWR readings on any of the WARC bands. Of course, you must remember that these bands are rather narrow and I expected no problems in the bandwidth area.

Contacts were easy on each band, and the limited amount of directivity afforded by rotation was as expected. In other words, it was about 3 or 4 S-units down on the side (per my S-meter), compared to reception from front/back. This is a definite edge over a fixed wire dipole and it improves with antenna height.

Although the D3W is rather expensive at a list price of $200, it is much nicer than a set of wire dipoles for doing the same job. The wire dipoles, if fed from a single feedpoint, would require support points for the center insulator and each dipole end, for a total of seven. The D3W uses only one support.

The antenna is disassembled as easily as it is assembled. I think the antenna would be excellent for portable and field day operations. Just remember to use a container for all the small hardware.

Specific Features

The best features of the D3W are its all-stainless steel hardware, that it turns with a TV rotator, and its capability for portable operation.

On the other hand, the screw clamps for fastening the elements together are too large and require a lot of tightening up.

The D3W is well-built, with typical triband construction. I recommend the antenna with the understanding that it is a rotatable dipole, not a beam antenna.

Included with the antenna instruction was a sheet of information about lightning protection and Cushcraft's series of gas discharge lightning protection devices. Read this information and take the action you deem appropriate for your station's operational and investment safety.

Also included was a general antenna installation sheet on safety—excellent reading. 73

Bill Clarke WA4BLC, aviation writer and well-known reviewer for 73, may be reached at Box 2403, Fall Church VA 22042.

Manufacturer's Specifications

Bands	12, 17, 30 meters
Bandwidth at 2:1 SWR	entire band
SWR at Resonance	1.5:1
Power Ratings	2000 W PEP
Length	34″
Max. Mast Diameter	2″
Wind Load	0.9 sq. ft.
Weight	11 lbs.

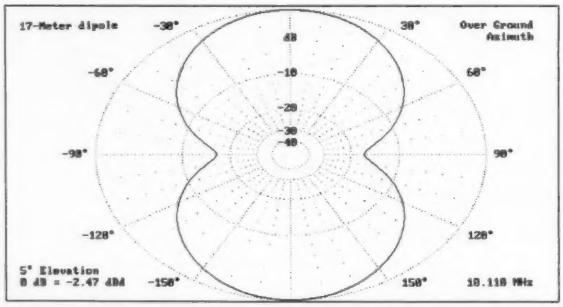


Figure 1. This figure and Figure 2 show the radiation patterns of a typical 17-meter dipole installed at 35 feet.

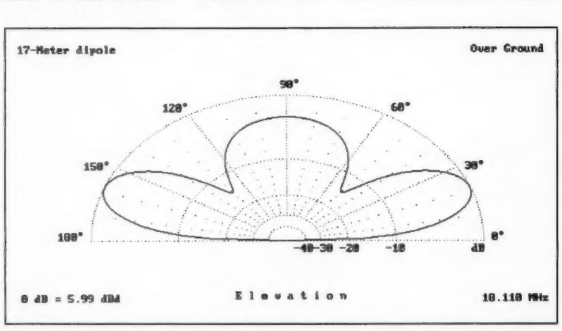
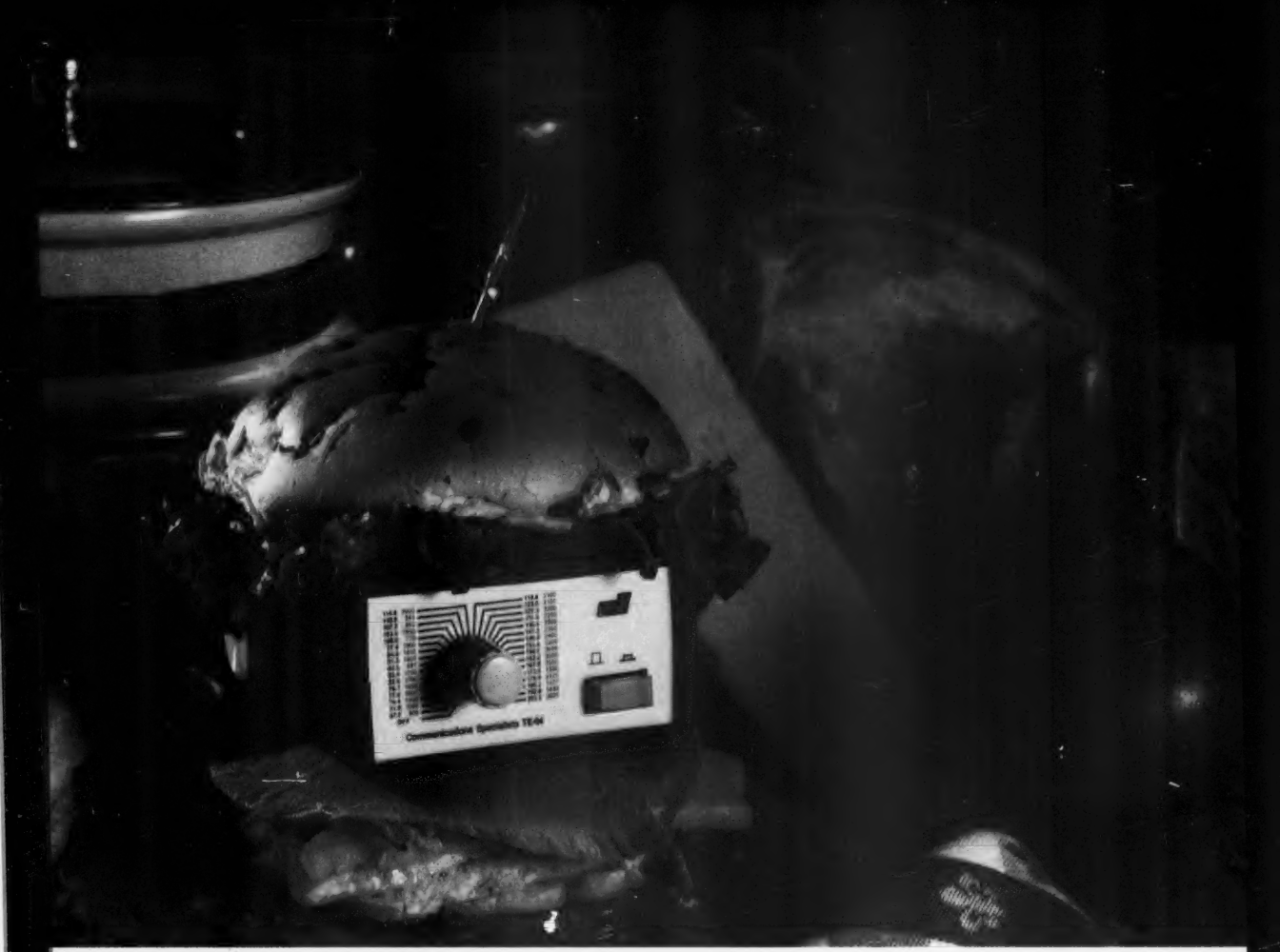


Figure 2. The expected pattern of the D3W on 17 meters when installed at the same height. These patterns were generated by Brian Beezley's MN 2.00 Antenna Software, which the author has found highly accurate.



Food for thought.

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71.9 XA	94.8 ZA	123.0 3Z	162.2 5B
74.4 WA	97.4 ZB	127.3 3A	167.9 6Z
77.0 XB	100.0 1Z	131.8 3B	173.8 6A
79.7 SP	103.5 1A	136.5 4Z	179.9 6B
82.5 YZ	107.2 1B	141.3 4A	186.2 7Z
85.4 YA	110.9 2Z	146.2 4B	192.8 7A
88.5 YB	114.8 2A	151.4 5Z	203.5 M1

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- Frequencies to 250 Hz available on special order
- Continuous tone

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2175	941 1633	1750	2000	2300	2550
2805		1800	2100	2350	

- Frequency accuracy, ± 1 Hz maximum - 40°C to + 85°C
- Tone length approximately 300 ms. May be lengthened, shortened or eliminated by changing value of resistor

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CIRCLE 171 ON READER SERVICE CARD

A "Rad Radiator" For Your Walkie-Talkie

Replace your rubber ducky with a dipole.

by Bob Sumption W8MDV

Rubber ducky antennas (or should I say "rubber resistors") are cute and make us look like Kojak, but they are very poor radiators. I decided to confront this problem and come up with an easy-to-construct half-wave vertical dipole to enhance the performance of today's walkie-talkies. Such a dipole would also be suitable for testing to evaluate the rubber ducky's performance.

My walkie-talkie is a Kenwood TH-21, a shirt pocket unit with an output of one watt on high power and 150 milliwatts on low power. I made my own 19-inch whip for the unit because I wasn't able to buy one commercially.

You may already have a 19-inch whip, or have a different type of walkie-talkie. That doesn't matter—this project will work just the same. The wire part of the antenna can be attached to your walkie-talkie with a big alligator clip, or a clip of your own creation. The important thing is that you make a good connection to the ground shell of the antenna connector, as close as possible to the antenna base.

This antenna is not a new idea. I have seen it used elsewhere and I do not claim credit for its invention. My goal was to verify its performance and to inform my fellow amateurs about it.

Building the Whip

I built my antenna from an old scanner whip, a Radio Shack audio adapter (part number 274-389), a one-inch piece of #12 bare wire, and the center pin from an old solder-on phono connector. I used only part of the whip: a segment four sections long that would extend exactly 19 inches out of the connector shell when finished.

To make the whip, remove the pin from the center of an RCA solder-on connector and solder it to the #12 wire. Remove the plating from the bottom of your whip sections, using a file and tiny knife to do the inside. Drill out the top of your Radio Shack connector shell (I used the shell only) so it is straight and doesn't have a lip at the top. You can adjust the length slightly by shortening or lengthening the #12 bare wire. Remember to leave enough to allow 19 inches from the top of the connector shell to the tip of the whip when finished. Mine is exactly 19 inches, but a half inch more or less should be okay. Also, make sure that the center pin of the connector doesn't extend too far into the walkie-talkie. The Kenwood TH-21 has components right under the connector and you could damage them with a long connector pin.

Photo A. Deanna KA8YVI talking to Tony KB9AFW through the Plymouth, Indiana, repeater, WA9INM, 42 miles away.

When assembling your whip use the original rubber ducky antenna connector as a guide. I made mine too long and had to shorten it on the grinder. Luckily, I did not damage my walkie-talkie.

When you have the length correct, insert the whip and connector assembly into the connector shell. This is a good time to test the fit of the assembly on the unit. Make sure it all fits and the connector shell threads match your unit. When you are sure you have it correct, jam the bottom of the connector full of wadded-up pieces of masking tape and pack them tightly all around the connector pin. Next, mix up some epoxy glue and work it down around the whip until the connector is filled. I clamped my whip assembly into a vice to do this, then let it set overnight. Be sure to center the whip so that it doesn't short out to the connector shell. Also, extend the whip before gluing so you don't glue all the whip segments together. That was another goof I made once. When finished you should have a nice whip to use on your radio.

For the bottom half of the dipole use a piece of stranded hookup wire soldered to a piece of thin sheet brass (from the hobby shop) ⅜" wide by 1" long. Bend this piece into a C shape and slip it snugly over the outside of the connector shell. The wire is 19 inches long and hangs down when using the radio, forming the other half of a vertical dipole antenna.

How Well Does it Work?

My daughter Deanna KA8YVI helped with the performance testing. We tested the whip using a Wavetek field strength meter. The Wavetek had a 19-inch piece of wire on it that hung down the side of the table. The walkie-talkie, set on another table with the Wavetek fifteen feet away, was on high power with one watt output.

Test Results:
Readings on the Field Strength Meter

Rubber ducky antenna	11 dB
Whip alone	13 dB
Whip with wire	18 dB

These results show an improvement of seven dB over the rubber ducky antenna when using a full-size vertical dipole.

To verify the results on the air, we used the HT to work several repeaters. One of them was the WA9INM repeater 42 miles away in Plymouth, Indiana. The antenna of this repeater is at 400 feet. Deanna talked to Tony KB9AFW south of Plymouth through this repeater.

The new antenna made the difference between no contact at all and solid copy. I performed a simplex test with Dennis KA8BND in Buchanan, Michigan, over 20 miles away. Dennis reported that he could hear a signal when I used the rubber duck but he could not copy me. With the new vertical dipole it was again Q-5 copy. Dennis reported he was using a double trombone antenna at 25 feet.

In evaluating this antenna bear in mind that all rubber ducky antennas are not created equal, so comparisons with other walkie-talkies and rubber ducky antennas may vary.

Bob Sumption W8MDV has been licensed since 1958. He is now an Extra and works as a Laboratory Electronics Technician for Allied Signal (Bendix Division) in South Bend, Indiana. Bob is part of a ham family: His XYL Diane, daughter Deanna, and son Mike all hold Technician licenses. Contact Bob at 61250 Cass Road, Cassopolis MI 49031.

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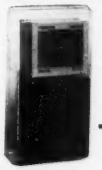

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LOOKING WEST

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In Search of Sarex-90

On September 29, 1988 space shuttle *Discovery* lifted into the warm Florida sky above Cape Kennedy and headed toward space. The world watched with great interest, for this, the 26th American shuttle launch was truly historic. Only two and a half years earlier, the *Challenger* catastrophe had claimed the lives of its crew of seven and kept the nation out of manned space operations as modifications were made to the remaining shuttles to ensure that such an accident would never happen again.

It was a flawless mission. The five veteran crew used their four days in space to deploy a new Tracking Data Relay Satellite (TDRS) and perform eleven major scientific experiments. Riding with the crew were not only the hopes and prayers of a nation, but also the dreams and aspirations of the amateur radio community. Ham radio knew it was destined to return to space.

Personal Memories

It was a chilly late November night in the City of Angels. Excitement was in the air. A few days earlier, from a launch pad 3,000 miles away, the majestic spaceship *Columbia* had risen in splendor and headed skyward. On board the STS-9 flight was the new European Space Agency's *Spacelab*. A new friend of mine, Dr. Owen Garriott W5LFL, would be one of those to man it.

At 8:30 PM local time I stood in the courtyard of what was then the Metromedia Square in Hollywood, in the shadow of a pair of 10-meter Harris dish antennas that were busy beaming signals to the sky. I was not there to transmit. My job was to listen, record and report. In one hand was my trusty ICOM IC-2AT. In the other, a small Panasonic cassette recorder with the audio from the ICOM's speaker jack hard-wired in. On my head was a pair of Senheisser earphones, probably worth more than the handheld and recorder combined. Like thousands of other hams across the nation and around the world, I was waiting to hear the first words from a radio amateur live in space.

Almost to the second predicted, the voice of W5LFL calling CQ from the space shuttle *Columbia* crackled in my ears. Within a minute, Owen was holding his first QSO with Lance Colister WA1JXN in Frenchtown, Montana. 1500 miles away, sitting in his hotel room on the 12th floor of the Nassau Bay Hilton Hotel across from the Johnson Space Center, my friend and colleague Roy Neal K6DUE listened over his IC-2AT to the same QSO. At that moment, we both knew that the face of amateur radio had changed forever, and we were proud to have been a part of it.

I find it hard to fathom that a decade has gone by since that first SAREX video planning meeting at Roy's old office at NBC News in Burbank, California. That was mid-1980. Eight years earlier Roy and I had met one another on the old K6MYK 147.24/.84 repeater. I was new to Los Angeles, but the voice of K6DUE was familiar from childhood memories of early NASA launches that featured such names as *Redstone, Mercury, Gemini* and *Saturn V*. The latter was the rocket that took man to the moon, and it was the voice and face of Roy Neal that had taken me there and had brought me home. Now, we talked regularly on 2 meters, but it would be two years before we would meet in person.

Making Movies

In a way, you might say that Dave Bell W6AQ is responsible for much of this story. Some of you may remember a ham convention in Las Vegas called SAROC. At SAROC-74, Dave cornered me to ask if I would help as advisor in the production of a short movie titled *Moving Up to Amateur Radio*. This was the era of the long gasoline lines and the general public playing at CB trucker and glorification of 11 meters. CB sets were everywhere, and Dave saw this as a golden opportunity to interest the radio-crazed public in a better form of personal communications called ham radio. *Moving Up To Amateur Radio* was a ten minute hard-sell aimed at showing CBers that there was more to life than coffee breaks, southern-sounding Brooklyn accents, and 10-4 Good Buddy! Its host and star was Roy Neal K6DUE.

1979 brought the three of us together for a second film. This one was the award winning *World of Amateur Radio* which, among other things, brought about my quitting a stable, albeit boring, job fixing VCRs for Sears Roebuck and returning to the business I love best.

The *World of Amateur Radio* was a turning point in another way. During its production, Roy and I became very close friends, and it was then that he shared with me his dream—and the dream of his buddy Owen Garriott—of taking a ham station into space. In the days of *Skylab*, Roy and Owen worked independently of each other. Owen's project, "Skylarc," for "Skylab amateur radio club," died before it could get off the ground. But the idea came back to life a few years later when Owen was assigned to *Spacelab* and General James Abrahamson, the man in charge of the shuttle program, agreed to use ham radio in the project.

Both Roy and Owen became hams at an early age. Owen was in high school when his dad started him studying code and theory at the Enid Amateur Radio Club in Enid, Oklahoma. This interest led him to a doctorate in engineering from Stanford University. He signed on with NASA in 1965 and spent two months in space in *Skylab*. Along with astronauts Alan Bean and Jack Losma, Owen participated in medical experiments, took 40,000 pictures of the sun to study solar flares and 16,000 photos of our planet to help evaluate earth resources. Dr. Garriott said his father's introducing him to amateur radio had the most profound effect on his career.

> ***"At that moment, we both knew that the face of amateur radio had changed forever, and we were proud to have been a part of it."***

I heard Owen voice these thoughts two years later as he sat in the 1-G shuttle simulator at the Johnson Space Center. Roy was interviewing him for the first of our ham-in-space videos, titled *Amateur Radio's Newest Frontier*. As Roy's youthful interest in radio had lead him to broadcast journalism and mine to broadcast engineering, Owen's had led him to become an astronaut!

I hung onto a ladder, clutching a 30-pound Sony BVU-110 recorder, thinking that ham radio in space might be the key to getting more young people back to the sciences and back to rebuilding the nation's technological base. A year later, as I stood by Metromedia's satellite dish complex, I knew it was coming to pass. The next few days confirmed my suspicion. If the hams loved working W5LFL, kids and educators were having a heck of a good time just listening in! With the success of W5LFL on *Columbia*, the Shuttle Amateur Radio EXperiment concept was proven, and the acronym SAREX was born.

Forming the Group Mind

In the months before the STS-9/ *Spacelab* 1 flight, Roy and I were up to our elbows generating videotape. Al Kaul W6RCL had come on board, working with Roy to build a story. Still, we needed a place to put it all together, with a video editor who understood the topic. A person who would be just as excited as Roy, Owen, Al and myself, and with the eye of an artist to boot.

Frosty Oden N6ENV heard we were looking for an editor and said that he was our man, having edited just about every type of show you can think of. Now with over a decade at CBS Television City, he not only wanted to edit our show, but he wanted us to do it at the CBS facility! How could we afford CBS-TVC on our meager budget? Frosty said not to worry, and set up a meeting between us and the Television City brass. Thus, the "group mind" of Neal, Oden and Pasternak was born, and it has prospered ever since.

Two videos were born from the preparations and flight of Owen Garriott W5LFL. Both were called *Amateur Radio's Newest Frontier*, but the newest included in-flight footage to replace simulations, and footage of actual contacts being made, including the first QSO from space between W5LFL and WA1JXN, and new narrative. Sounds easy, but in reality it meant creating a whole new show, and it was up to Frosty to be visually creative. One evening while Roy and I were away from the edit room having dinner, N6ENV created a 45-second clip depicting the entire history of manned US spaceflight. Many say this is the best clip in the show.

To the Young

If Owen Garriott W5LFL proved that hams could successfully operate from space, it was Dr. Tony England WØORE who conceived of this type of communication as a teaching tool. England's 51-F operation was primarily educational with the "DX sport" secondary. He wanted to talk directly with students in their classrooms, and the educational community was more than willing to oblige.

Tony flew on one of the last successful missions of the ill-fated shuttle *Challenger*. Mission 51-F in some ways may have been a precursor of problems to befall the *Challenger* later on. As some may remember, the first attempt at launch occurred on July 12, 1985. With only three seconds to go before ignition of the solid rocket boosters, a coolant control valve in the number 2 engine failed to close, and the on-board computers aborted the mission. By month's end, *Challenger* finally did lift off, but on its way into orbit a computer malfunctioned and cut off one of the engines prematurely. Commander Gordon Fullerton took manual control, and successfully maneuvered the *Challenger* into orbit, thus saving the mission and probably the lives of all on board!

Orbit was attained, but at a much lower altitude than expected. This meant recalculation of time lines for accessing the ham station. By August 1, the first slow-scan television pictures from space were beamed earthward by WØORE and received at NASA's Jet Propulsion Laboratory (W6VIO) in Pasadena, California, and schools and

private amateur stations around the world.

My memories of this mission are vivid. The day Tony began his operation, I was a part of the Los Angeles press corps, armed with a Sony video camera and recorder borrowed from Dave Bell, at the Chaminade School in Canoga Park, California. A group of students had assembled a world-class station for downlinking pictures from space, and maybe sending some back. Dr. England envisioned the Shuttle Amateur Radio Experiment, or SAREX, to be as much for educating youngsters about space as it was to give his fellow hams the most exotic DX contacts of their amateur careers.

As the appointed hour approached, the teen-age hams manning the Chaminade station grew more mature by the moment. They checked and double checked every calculation of acquisition time and beam heading, using their classroom computer. Mike Sioss, a news photographer from my station who had worked in Houston, remarked on how much the classroom atmosphere resembled Mission Control! Soon, at least 3,000 watts of Lowell lights were ablaze, and a dozen VCRs were rolling tape. The young hams began their routine of calling and listening as cameras zoomed in for close-ups, then widened for coverage. For a solid 20 minutes this routine continued, but to the chagrin of the kids, nothing was received—not one peep from W0ORE. Not one chirp of SSTV.

Mike, a KTTV reporter, and I headed over to JPL to see if the ham club there was having any success. Being already credentialed and knowing the way to the W6VIO trailer, I opted to lead the way. En route, I called Dr. Norm Chalfin K6PGX to tell him I was on my way.

Norm met us at the security gate and rode over to the station in our mini-motorcade. The W6VIO crew reported better luck than the kids at Chaminade. They had seen some video on the first pass and were pretty certain that voice contact would be established on the following orbit. Seated at the operating position was then ARRL Southwestern Division Director Jay Holliday W6EJJ, and with the pass due momentarily, Mike and I quickly hung a pair of Sony ECM-50 mikes from the tie of W6EJJ. This time we were partly successful, as depicted later that night on KTTV's 10 PM news and in the SAREX video produced later by the team of Neal, Oden and Pasternak. No, Jay did not make contact, but Tony was at least heard!

It appears that the first successful two-way SSTV contact took place between W0ORE and Bryan Davies GW3KYA operating the club station GW3GW from the Blackwood District School in Gwent, Wales on August 2 during orbit 61. As Davies told me, he received a call from the hams at NASA/JSC telling him to keep an ear open. "About ten minutes later, W0ORE came up out of the noise. It was marvelous, simply marvelous." The QSO lasted a solid six minutes and included the transmission to GW3GW of an SSTV picture of Tony operating the SAREX rig.

This QSO was significant in another way. It proved something scientifically and strategically important that NASA had been wondering about for years. Could television be sent to an orbiting shuttle? Theory said probably, but ham radio proved the answer was "definitely." This alone may have enhanced the position of amateur radio with NASA's top-brass, and may be one of the reasons we of amateur radio have been invited back on board.

The Bleak Years

After the *Challenger* disaster, when the nation paused to reassess its space program, many amateurs never lost their dream of returning to space. These hams recognized that their future was not in the madhouse of 20 meters nor the insipid repeater ker-chunks of 2 meters, so unappealing to the young.

The teen-ager of the mid-80s was computer literate. Radio was what you listened to heavy metal music on; two-way radio was the cellular telephone in someone's car. A decade earlier, the public may have confused CB with amateur radio, but now they paid it little attention.

Inside amateur radio, strife was growing as well. Some were openly saying on the bands that kids had no place in the hobby. Club members grew older, colder, and grayer as fewer youngsters came on board. For those who did venture through the carefully guarded gates of Ham Radiodom, the welcome was often far from warm. Amateur radio was not just dying, it was committing suicide.

But there were some who remembered the lights in the eyes of young ones who heard that voice from space, as Owen Garriott and Tony England talked or sent television pictures from orbit. While the nation's youth may have become complacent about nearly every other facet of life, spaceflight still intrigues them. Check the demographic breakdown of audiences for television shows like *Star-Trek, The Next Generation*. By and large, its audience is young and intelligent.

The *Challenger* disaster brought to view a subtler tragedy, one that Wayne Green had recognized and harped on for years: The loss of technology from this nation to foreign shores. In the 80s the yuppie, young upwardly mobile professional, surfaced. Interest in scientific achievement was replaced by avarice. Colleges and universities which had been creating the nation's technological base were now turning out lawyers and accountants. The goal was instant success and wealth, at all costs. Technology was something to be sold at a profit to Japan, Korea or the highest bidder.

Without a sound base in science and technology, a nation must depend on other nations for technological survival. As I look around me I see only this computer as a predominantly US made product, and even it incorporates some foreign manufactured integrated circuits. The TV, VCRs, and ham gear are marked "Made in Japan."My cassette and microcassette recorders, marvels of miniaturization, are not our nation's technology. Our latest acquisition may bear the name General Electric, but closer inspection reveals the words "Manufactured in Korea." Examining the products in my home was a real eye-opener. With the exception of a decade-old microwave and a six-year old RCA teleset, I couldn't find any electronic device made in the United States!

"These hams recognized that their future was not in the madhouse of 20 meters nor the insipid repeater ker-chunks of 2 meters, so unappealing to the young."

The Voyage Home

In *Star-Trek IV, The Voyage Home*, a small group of time-travelers was able to save the earth from destruction due to human short-sightedness. Since humanity had killed all the whales, there were none to communicate to the powerful outsider that all was well. To save the planet, Capt. James T. Kirk and his crew used a Klingon "Bird of Prey" to travel back in time and bring two of the giant mammals to the future. Their success meant salvation.

In like manner, I feel that SAREX-90 could begin the salvation of the United States. These two flights will catch the attention of youngsters, bringing the marvel of amateur radio communication into their world. While few children will get the chance to speak to the astronauts directly, many will be able to send written questions. Communication to the spacecraft will be relayed from Australia and possibly Africa and South America. Ham clubs can help by providing the equipment, whenever possible, for listening in.

As Capt. Kirk and his crew used the past to save the future, some of our amateur radio leaders are doing the same. The basic SAREX technology is known to work, so in SAREX-90 we are turning a good part of it over to the next generation to entice them into careers in science and technology.

SAREX-90 by itself will not rebuild the nation or ham radio. Nor will no-code. But, as the last SAREX-90 flight comes to an end, we can expect the introduction of a no-code license. The timing couldn't be better. With SAREX fresh on their minds, and an easier entry into amateur radio, there is no telling how many vital young hams may come to the service, and become the engineers who rebuild the nation's technological base.

The success of SAREX-90 could bestow a great future on our service. Before the turn of the century, NASA plans to have *Space Station* built and operational. *Space Station* will be a habitat where astronauts will live, work and play on long missions. Plans are already underway to make amateur radio a permanent part of *Space Station*, for both back-up communications and recreation. This will be amateur radio's gateway to outer space. 73

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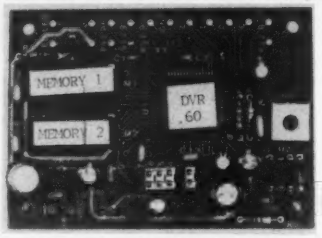

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- 32KBPS Sampling Rate for Natural Sounding Audio
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- Message Select: Up to 4 Lines Binary Code
- Signal to Noise Ratio 55 dB • Power Requirements 9-15 VDC @ 50 ma Peak
- Distortion Less Than 2% THD • Completely Wired and Tested. NOT a Kit.

The DVR-60 is provided with full documentation. Four holes are provided on the PC board for mounting convenience. All input/output lines and component designations are clearly silk screened on the board.

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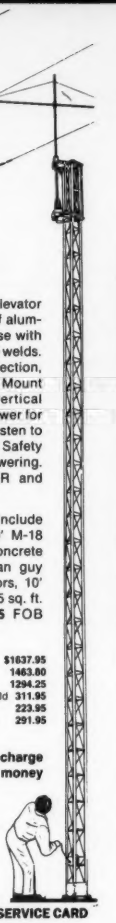

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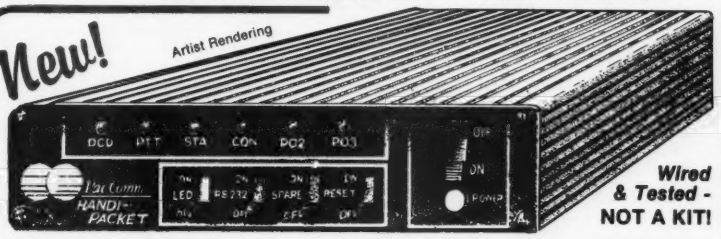

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REP-200 REPEATER

If you always thought a computer-controlled repeater had to be expensive, LOOK AGAIN! You could easily spend this much just for a controller.

As always, Hamtronics strives to give *superb performance* at *modest cost!* In this case, a premium repeater with versatile computer control, autopatch, and many dtmf control features at *less than many charge for a bare-bones repeater!*

We don't skimp on rf modules, either! Check the features on R144 Receiver, for instance. GaAs FET front-end, helical resonators, sharp crystal filters, hysteresis squelch.

We completely re-thought the whole idea of what a repeater should be, to give the *best features* at the *lowest cost.*

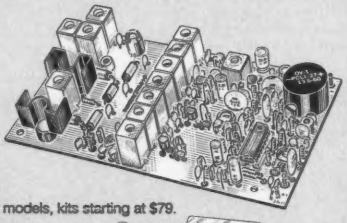
ONLY $1295!

- Available for the **10M, 6M, 2M, 220MHz, 440MHz, 902MHz** ham bands. *FCC type accepted models also available for vhf and uhf commercial bands.*
- **Rugged exciter and PA,** designed for continuous duty.
- Power output 15-18W (25W option) on 2M or hi-band; 15W on 220MHz; 10W on uhf or 902MHz.
- Accessory add-on PA's available with **power levels up to 100W.**
- **Five courtesy beep types,** including a pleasant multi-tone sequence.
- **AUTOPATCH:** either **open or closed** access, **toll-call restrict,** auto-disconnect.
- **Reverse Autopatch,** two types: auto-answer or ring tone on the air.
- **DTMF CONTROL:** over 45 functions can be controlled by touch-tone. Separate 4-digit control code for each function, plus extra **4-digit owner password.**
- **Owner can inhibit** autopatch or repeater, enable either open- or closed-access for repeater or autopatch, and enable toll calls, reverse patch, kerchunk filter, site alarm, aux rcvr, and other options, including two auxiliary external circuits.
- The cwid message, dtmf command codes, and owner-specified default parameters for cor and cwid timers and tones are burned into the eprom at the factory.
- Cw speed and tone, courtesy beep and tail timers, and courtesy beep type **can all be changed at any time** by owner-password-protected dtmf commands.
- Many **built-in diagnostic** & testing functions using microprocessor.
- Color coded led's **indicate status** of all major functions.
- **Welded partitions** for exciter, pa, receiver, and controller. PEM nuts for covers.
- 3-1/2 inch aluminum rack panel, finished in eggshell white and black.
- **Auxiliary receiver input** for independent control or **cross linking repeaters.**

There are many other features, too numerous to mention. Request catalog for full details.

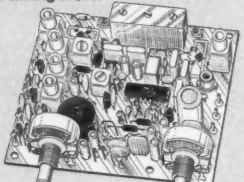
HIGH PERFORMANCE XMTRS & RCVRS FOR REPEATERS, AF & DIGITAL LINKS, TELEMETRY, ETC.

FM EXCITERS: kits $99, w/t $169. 2W continuous duty. TCXO & xtal oven options available. *FCC type accepted for com'l uhf & hi bands.*

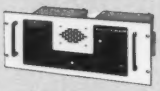


- **TA51** for 10M, 6M, 2M, 150-174, 220MHz.
- **TA451** for uhf.
- **TA901** for 902-928MHz, 0.5W out (w/t only, $169).
- **VHF & UHF AMPLIFIERS.** For fm, ssb, atv. Output from 10W to 100W. Several models, kits starting at $79.

FM RECEIVERS: kits $139, w/t $189.



- **R144/R220 FM RECEIVERS** for 2M, 150-174, or 220MHz. **GaAs FET** front end, 0.15uV sensitivity! Both crystal & ceramic if filters plus **helical resonator** front end for exceptional selectivity: >100dB at ±12kHz (best available anywhere!) Flutter-proof hysteresis squelch; afc tracks drift.
- **R451 UHF FM RCVR,** similar to above
- **R901 902-928MHz FM RCVR.** Triple-conversion, GaAs FET front end.
- **R76 ECONOMY FM RCVR** for 10M, 6M, 2M, 220MHz, w/o helical res. or afc. Kits $129.
- **Weather satellite & AM aircraft rcvrs** also available.



If you prefer a plain-vanilla or kit repeater, you couldn't find a better value than our original REP-100 REPEATER

Same fine rf modules as REP-200 but with COR-4 Controller. Can add autopatch, dtmf decoder, CTCSS, either now or later. **Kit only $675, w/t $975.**

ACCESSORIES

COR-3 REPEATER CONTROLLER kit. Features adjustable tail & time-out timers, solid-state relay, courtesy beep, and local speaker amplifier $49

CWID kit. Diode programmed any time in the field, adjustable tone, speed, and timer, to go with COR-3 ..... $59

***NEW* COR-4** kit. Complete COR and CWID all on one board for easy construction. CMOS logic for low power consumption. Many new features. EPROM programmed; specify call .. $99

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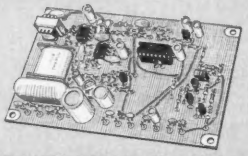

AP-3 AUTOPATCH kit. Use with above for repeater autopatch. Reverse patch & phone line remote control are std . $79

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LNW-(*) MINIATURE GaAs FET PREAMP

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- GaAs FET Preamp similar to LNG, except designed for **low cost & small size.** Only 5/8"W x 1-5/8"L x 3/4"H. Easily mounts in many radios.

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***ONLY* $79**/kit, **$99** wired/tested

- GaAs FET Preamp with features similar to LNG series, except **automatically switches out of line during transmit.** Use with base or mobile transceivers up to 25W. Tower mounting brackets incl.

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Preamps with 3 or 4 section helical resonators **reduce intermod & cross-band interference** in critical applications. **MODEL HRA-(*),** $49 vhf, $94 uhf.

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Low noise converters to **receive vhf and uhf bands on a 10M receiver.** Choice of kit with case & BNC jacks, kit with pcb only, or w/t unit in a case. Other models available for other in/out ranges & atv. *Request catalog for complete listings.*

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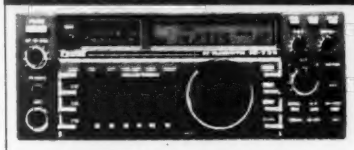

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2335 PA	10W in 35W out	1240-1300 MHz	$315
2340 PA	1W in 35W out	1240-1300 MHz	$355
2370 PA	5W in 70W out	1240-1300 MHz	$695
3318 PA	1W in 20W out	902-928 MHz	$265
3335 PA	14W in 40W out	902-928 MHz	$320
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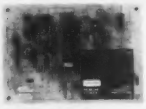

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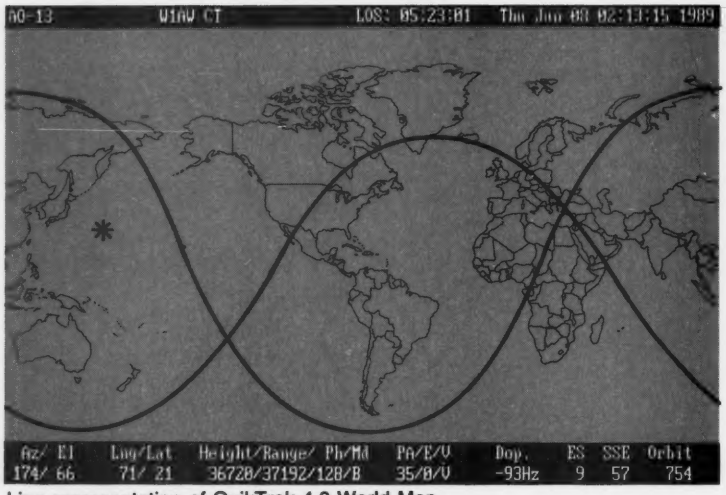
Two new IBM-PC compatible programs that will make your satellite tracking faster, easier and more colorful.


AO-13 W1AW CT LOS: 05:23:01 Thu Jun 08 02:13:15 1989
Az/ El Lng/Lat Height/Range/ Ph/Md PA/E/V Dop. ES SSE Orbit
174/ 66 71/ 21 36720/37192/128/B 35/0/0 -93Hz 9 57 754

Line representation of QuikTrak 4.0 World Map

QuikTrak 4.0

Whether you want to identify the next time Oscar 13 will provide communications between two cities or if you just want to know the next time you can visually sight the Soviet space station MIR, QuikTrak will let you plug in the latest Keplerian elements for up to 100 satellites using a new full screen editor. QuikTrak also supports auto-tracking.

Observe a single satellite in realtime or select multiple satellites and set priorities among them. You can track satellites from over 100 different cities and the satellite ground track and foot print is graphically depicted on a world map using either CGA or EGA graphics.

Hardware requirements, IBM PC, AT, PS/2, or clone with minimum 512k memory. Any monitor for text and CGA for color. *Numeric* coprocessor not required but math recommended.

InstantTrack 1.0

For those concerned with greater speed and capability, InstantTrack offers all of QuikTrak's features plus instant visibility for your "favorite" satellites before you issue the first keystroke. More than 200 satellites and 1754 cities are on the menu and will be displayed in full-color high-resolution EGA or VGA modes.

InstantTrack also works in background mode, tracking a satellite and pointing your antenna while you run other programs.

Hardware requirements: IBM PC, AT, PS2 or clone with at least 512k memory. EGA or VGA graphics required. Numeric coprocessor not required but recommended. Mouse not required but can be used on the map screens.

These are only a few of the features of QuikTrak and InstantTrack. The figures below reflect suggested donations to defray production expenses and benefit AMSAT's non-profit, educational activities.

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InstantTrack 1.0	_____	5¼"	$50	$70	$

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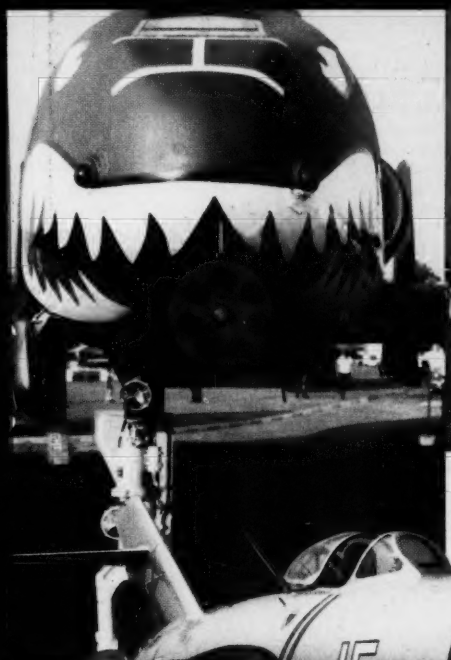
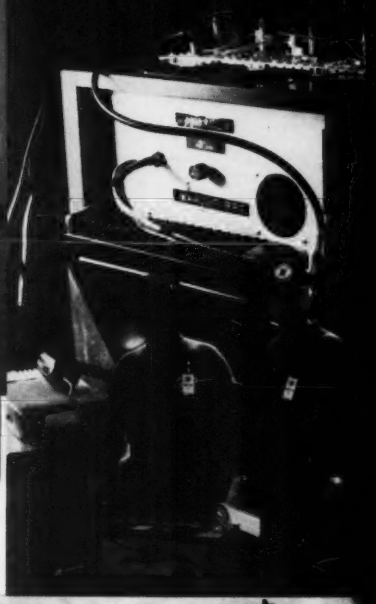




Amateur radio operators join forces to get the "Say no to drugs" word out!

At the Huntington, West Virginia, Tri-State Anti-Drug Air Show last September hams from the Tri-State Amateur Radio Association (TARA) were part of the emergency network. TARA members used two meter simplex frequencies and a portable two meter repeater to coordinate communications to checkpoints throughout the 50-acre air show area. The 36 amateurs participating donated more than 400 man-hours.

Lawrence County (Ohio) Sheriff Dan Hieronimus said, "This is the first year amateur radio operators were used in such a capacity, and it was the best-ever air show as far as communications were concerned."

Information and photos courtesy of Michael Love WB8YKS, TARA Historian.

HAMSATS

Amateur Radio Via Satellite

Andy MacAllister WA5ZIB
14714 Knightsway Drive
Houston TX 77083

Beyond Microsats

On Wednesday, February 7, 1990, Fuji-OSCAR-20 was sent into orbit from the Tanegashima Space Center in southern Japan. It was launched on an H-1 rocket with Marine Observation Satellite 1B and the experimental DEBUT satellite. F-O-20 is performing flawlessly.

F-O-20 has both digital and analog Mode J transponders. All uplinks are on two meters with downlinks on 70 cm. The digital package is identical to the now silent F-O-12. It uses packet AX.25 protocol with four discrete FM uplink channels and BPSK (biphase shift keying) for the downlink. The analog transponder is 100 KHz wide and inverting. A lower sideband signal transmitted by a ground station high in the transponder passband will be heard on upper sideband low in the downlink passband.

Thanks to efficient gallium arsenide solar cells and a larger surface area available for cells, F-O-20 has much more power available for the communication and command systems than F-O-12. The power output is more than 10 watts at the beginning of life in orbit. F-O-12 had only 6.5 watts available. Power budget problems kept F-O-12 from lasting more than a few years.

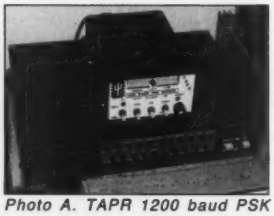


Photo A. TAPR 1200 baud PSK modem hooked up to a packet TNC and ready to go for Microsat or Fuji digital communications. (WA5NOM photo)

The need for lengthy recharge periods with the computer off hampered BBS activity, since the memory would be erased after only a day or two of activity. F-O-20 should be able to maintain the memory during charge or strictly analog operating periods. Enough power may be available to run both the analog and digital transponders simultaneously.

More details on F-O-20 (known as JAS-1b prior to launch) can be found in the September 1989 "Hamsats" column in *73*. The September 1989 issue of *QEX* from the ARRL carried the article "Introduction of JAS-1b," from the JARL (Japan Amateur Radio League).

Taking Stock

Since the beginning of the year, SEVEN new amateur satellites have been launched. Table 1 provides data on the systems of each.

Today we have 10 active hamsats, if you include the intermittent activity of AMSAT-OSCAR-10. Unfortunately, little has been heard from UoSAT-OSCAR-15 since January 22. Experiments on U-O-15 include a camera imaging device, transputer data processing units and advanced European-made solar cells. Efforts are underway to determine why it has not been transmitting.

The microsat launch program has strained AMSAT's budget. If you have been thinking about joining, now is the time. Your support is needed. Contact AMSAT at (301) 589-6062. You can also write to: *AMSAT, 850 Sligo Ave. #600, Silver Spring MD 20910.*

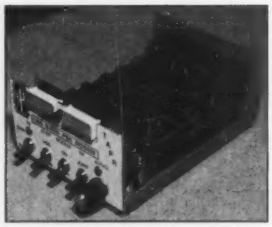


Photo B. Inside view of the TAPR 1200. (WA5NOM photo)

Membership is $30.00 per year and includes a subscription to the current newsletter and discounts on software. Dues pay for publications, salaries for AMSAT's two paid employees (everyone else is a volunteer) and more hamsats. Look at it as an investment in amateur radio's future.

AMSAT-OSCAR-10 provides Mode B (70 cm up and two meters down) operation whenever the solar panels are properly illuminated. The apogee of this satellite's orbit has drifted to the south giving excellent operation to South America, Africa and the South Pacific, including Australia and New Zealand. The on-board computer no longer functions due to radiation damage to the memory circuits.

UoSAT-OSCAR-11 continues to send telemetry using 1200 baud Bell 202 format tones on 145.825 MHz FM. Bulletins of interest are sent between frames of telemetry. On selected days, the digitalker can be heard speaking telemetry numbers in easily-understood English.

AMSAT-OSCAR-13 is still the most versatile satellite with Mode B, J, L (23 cm up and 70 cm down) and S (70 cm up and 13 cm down) transponders. The apogee of its elliptical orbit has been drifting slowly northward. Roundtable contacts between hams in Asia, Europe and North America are now very common.

UoSAT-OSCAR-14 is performing well with 1200 baud ASCII downlink signals on 70 cm. The satellite has cosmic particle and total radiation dose detection devices, along with a packet radio communications experiment. It will be available for digital communications when the control operators have qualified its on-board systems. Signals are loud and can be decoded on units like the PK-232 that have been hardware-modified for inverted mark/space tones. Any system capable of downloading from U-O-11 is ready for U-O-14, if it has an appropriate 70 cm FM receiver.

PACSAT-OSCAR-16 is now available for store-and-forward packet operation. The digital transponder is completely compatible with any station that operated through F-O-12's Mode JD digital system. Sponsored by AMSAT-NA, and monitored by control stations here in the States, this satellite provides a useful link for terrestrial packet systems. Gateway stations will be set up in major metropolitan areas for message forwarding through this hamsat.

The DOVE

DOVE-OSCAR-17, sponsored by BRAMSAT (AMSAT Brazil), has become extremely popular. With over four watts output on 145.825 MHz, it can be heard by almost any two meter FM radio. Many home stations with only small omnidirectional antennas can hear the signals and receive the standard packet telemetry. There have been many reports from enthusiasts with only HTs and "rubber duck" antennas.

DOVE stands for Digital Orbiting Voice Encoder. When the ground-control stations both here and in Brazil get operations sorted out, the voice operations will begin. We expect that voice will dominate over packet by a four-to-one ratio.

Two forms of digital voice are possi-

Table 1. Frequencies and modes of the new Hamsats.

UoSAT D	UoSAT-OSCAR 14 or UO-14 or UO-3
Uplink	145.975 MHz 9600 bps AFSK (FM)
Downlink	435.070 MHz 9600 bps AFSK (FM) G3RUH or K9NG 9600 baud modem or 435.070 MHz 1200 bps AFSK (NBFM Standard Bell 202 modem
UoSAT E	UoSAT-OSCAR 15 or UO-15 or UO-4
Downlink	435.120 MHz 9600 bps AFSK (FM) AX.25 G3RUH or K9NG 9600 baud modem or 435.120 MHz 1200 bps AFSK (NBFM)Standard Bell 202 modem
Note: CCD camera, 740x960 km view. Sat. not heard since launch day.	
PACSAT	AMSAT-OSCAR 16 or AO-16
Uplink	145.900, 145.920, 145.940, 145.960 MHz AFSK (FM) 1200 baud AX.25 Manchester Normal PSK Downlink437.02625 MHz 1200 bps BPSK (SSB) AX.25 Raised Cosine Downlink437.05130 MHz 1200 bps BPSK (SSB) AX.25
S-Band Downlink	2401.1428 MHz 1200 bps BPSK (SSB) AX.25 TAPR or G3RUH or PacComm PSK modem
DOVE	DOVE-OSCAR 17 or DO-17
FM Downlink No. 1	145.82516 MHz 1200 bps AFSK (FM) AX.25 or digital voice messages
FM Downlink No. 2	145.82438 MHz 1200 bps AFSK (FM) AX.25 or digital voice messages Standard packet TNC for either signal
S-Band Downlink	2401.2205 MHz 1200 bps BPSK 1 watt TAPR or G3RUH or PacComm PSK modem
WEBERSAT	WEBER-OSCAR 18 or WO-18
Normal PSK Downlink	437.07510 MHz 1200 bps BPSK (SSB) AX.25
Raised Cosine Downlink	437.10200 MHz 1200 bps BPSK (SSB) AX.25 TAPR or G3RUH or PacComm PSK modem
ATV NTSC Uplink	1265.000 MHz AM-TV
Note: CCD camera, 350 x 350 km view	
LUSAT	LUSAT-OSCAR 19 or LO-19
Uplink	145.840, 145.860, 145.880, 145.900 MHz AFSK (FM) 1200 bps AX.25 Manchester
Normal PSK Downlink	437.15355 MHz 1200 bps BPSK (SSB) AX.25
Raised Cosine Beacon	437.12580 MHz 1200 bps BPSK (SSB) AX.25 TAPR or G3RUH or PacComm PSK modem
LU-AMSAT CW Beacon	437.125 MHZ 12 wpm CW telemetry 750 mW
Microsats AO-16, DO-17, WO-18, LO-19 Maximum RF power output: 4.0 watts Raised Cosine (PSK) transmitter PEP: 9.0 watts S-Band transmitter output: 1.0 watt BPSK units are capable of 4800 baud operation in addition to 1200 baud.	
Fuji Oscar 20 or FO-20 or JAS-1b	
JA Uplink	145.900 to 146.000 MHz
JA Downlink	435.900 to 435.800 MHz 1 watt
JD Uplink	145.850, 145.870, 145.890, 145.910 MHz AFSK (FM) 1200 bps AX.25 Manchester
JD Downlink	435.910 MHz 1200 bps BPSK (SSB) AX.25 TAPR or G3RUH or PacComm PSK modem
JA Beacon	435.795 MHz 100 mW CW

Photo C. At W5RRR, the Johnson Space Center ham club, during the Microsat launch (L to R): WD5GAZ, N5FVM, WA5LHM, N5JXS, N5LKJ, WA5NOM and K5ZC.

ble. The system is capable of creating voice by using phoneme building blocks, or it can reproduce messages that have been recorded on Earth, digitally encoded, transmitted to the satellite and stored in memory. A possible use for DOVE is to send AMSAT bulletins by satellite similar to the method used by U-O-11, but with two distinct differences. DOVE has much more transmitter power, and it can send standard packets. Anyone with a simple omni antenna and a packet TNC (terminal node controller) can get the bulletins. Six hours after a control station uploads a bulletin to the satellite every person on Earth interested in receiving the message will have had a pass to do so. Scheduling the use of this extraordinary resource will be the responsibility of BRAMSAT's president, Dr. Junior Torres de Castro PY2BJO, and others in the BRAMSAT organization.

Photo E. WA5LHM and WA5NOM check orbital predictions for the new Microsats shortly after launch.

And More...

WEBER-OSCAR-18 has begun picture transmissions. The CCD (charge-coupled device) camera has taken many pictures for downloading via the BPSK 70 cm transmitter. Several of the first pictures were dark since the camera was aimed toward space, but the ninth picture, although blurry, was of the Earth. This encouraged ground control stations at Weber State University in Ogden, Utah, to get WEBERWARE picture-decoding software out and available to AMSAT control stations. The satellite has several experiments on board, but the imaging activities have proved to be the most popular. Check with AMSAT-NA for prices on WEBERWARE. Substantial discounts are available for members. AMSAT also has tracking software for most popular computers.

LUSAT-OSCAR-19 sponsored by AMSAT Argentina is virtually identical to P-O-16 except for its CW-telemetry beacon on 70 cm and the placement of the attitude alignment magnets. Its orientation slightly favors the Southern Hemisphere. The CW beacon from this microsat was one of the first signals heard by stations monitoring the launch and listening for signals from the new satellites. On-board systems are performing extremely well.

Fuji-OSCAR-20, as noted above, is our newest hamsat and provides an analog (voice and CW) transponder in addition to a digital communications system. One station, KA5DNP, reported three sideband contacts on one pass using 50 watts on the two meter uplink to an attic-mounted ground-plane antenna, and a nine-inch copper loop on a wooden curtain rod in the shack with a preamp for the 70 cm downlink. Satellite operation need not require expensive equipment.

RS-10/11 from the U.S.S.R. has continued with Mode A (two meters up and 10 meters down) operation. Reports from RS3A at Moscow University indicate there has been some difficulty uploading commands to RS-10, but no serious interruptions to satellite use are anticipated. The ROBOT autotransponder has been off during periods when its memory buffer has been full and not yet cleared.

RS-11, which is physically attached to RS-10, is still operational but is not active when RS-10 is on. RS-11 probably won't be usable until RS-10 becomes uncommandable from the ground.

SAREX Update

The March "Hamsats" column featured information about the upcoming SAREX (Shuttle Amateur Radio EXperiment) mission originally scheduled for April 1990. It now looks like there will be a May launch. The astronauts will be able to watch for access to specific ground stations by using software developed by W5SXD and WB5CCJ of Silicon Solutions, a Sugarland, Texas, company. The modified version of SSI's GrafTrak 2 will run on the GRID computer used by Ron Parise WA4SIR during the mission. 73

Photo D. N5LKJ, WA5NOM and N5JXS get ready for the first signals from the Microsats at W5RRR.

UPDATES

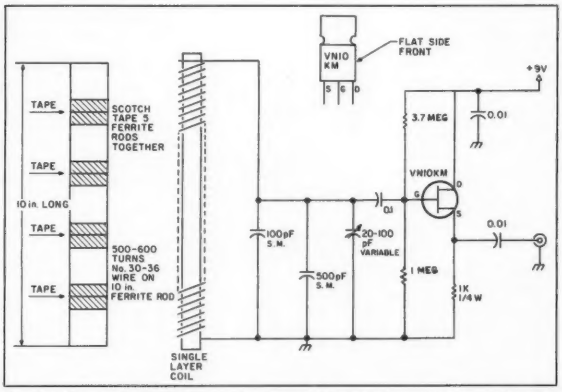
Number 15 on your Feedback card

USS Drum Special Event

Refer to "Special Events" in the April issue. The Special Event Station K4RQQ, operated on April 11th by the Mobile ARC from the radio room of the of the submarine *USS Drum*, is commemorating the 90th (NOT the 75th) anniversary of the US Naval Submarine Service.

ICOM America Service

The ICOM Service Survey by Gordon West WB6NOA, scheduled to appear in this issue, has been moved up to the June issue. Look for it then!



See the "Above and Beyond" schematic on page 45 of the February 1990 issue. This is the corrected schematic (the 3.7 and 1 meg resistors had been left out), with improvement (note the 0.1 µF capacitor between the coil and gate), for the 60 kHz ferrite rod antenna's FET amplifier.

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—*CD Review* 10/10 Nov.'89.
DDD 55m '89 **KSR101 $15**

☐**Anita O'Day: In A Mellow Tone**
Anita O'Day, the famous jazz singer, has recorded albums with Gene Krupa, Benny Goodman and other great bands. But she has often talked about doing an album of her favorite songs that were never recorded. Here is that album.
AAD 55m '89 **DRG5209 $12**

☐**Peggy Lee: Miss Peggy Sings the Blues**
"You'd have to look hard to find a more mellow vocal album than this one. Jennifer Holliday, Diane Schuur, Patti Labelle, and all the other screamers who mistake volume for soul ought to be locked up with this album until they get it right."
—*Stereo Review* Dec.'89
CD Review readers 9.8/9.8
DDD 48m '88 **MUM60155 $15**

☐**Vivaldi: Viola d'amore Concertos**
Liszt Ferenc Chamber Orchestra, Janos Rolla
Five of Vivaldi's six concertos for this unique instrument are performed on this CD. The soloist, Laszlo Barsony, offers you the chance to revel in the sheer beauty of the viola d'amore's sound.
CD Review 10/10 Jan.'87
ADD 54m '86 **HUN12162 $18**

☐**Antonio Vivaldi: The Four Seasons**
Philharmonia Virtuosi, Richard Kapp; Paul Peabody, violin
Also includes *Concerto for 2 Violins in A minor, Opus 3, No. 8*. This disc "eliminates all others from the competition. Buy this disc!"—*CDR*
CD Review 10/10 Aug.'88
DDD 50m '88 **ESS1001 $15**

☐**Telemann & Vivaldi: Concertos for Recorder, Baroque Bassoon, & Strings**
The Drottningholm Baroque Ensemble
The level of musicianship is so high, the sound of these instruments so appealing, and the music so accessible, just about anyone could find something here they would like, especially if you're a fan of Baroque wind music.
CD Review 10/10 Jan.'86
DDD 52m '85 **BIS271 $18**

☐**James Dale: Bach to Sousa**
This stunning recording of one of the largest pipe organs in the world features Bach's "Come Sweet Death," Wagner's "Pilgrim's Chorus," Sousa's "Stars and Stripes Forever," Samuel Barber's "Adagio for Strings" (Theme from *Platoon*), and much more.
DD 72m '89 **PNR101 $15**

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☐**Rob McConnell & the Boss Brass: Live In Digital**
Here's a recording for the most discerning audiophile.
DDD 67m '88 **RBJ106 $15**

☐**Lenny Breau: Last Sessions**
Except for his acoustic playing of "Paris," Breau mainly plays electric guitar on this disc.
AAD 50m '88 **ADE5024 $15**

☐**Tim Heintz**
Keyboardist Tim Heintz has quickly become one of the hot new talents to watch for.
AAD 36m '89 **TBA246 $12**

☐**Plunky: Tropical Chill**
Here's a disc of original recordings by the studio musician for the new *Cosby Show*.
ADD 48m '89 **OPD19891 $15**

JAZZ

☐**Scott Joplin's Ragtime**
Pianist Scott Kirby lives and breathes Joplin. You'll be unable to keep from dancing to his fast rags and you'll feel like sobbing during some of his slow pieces. You've got to hear him play! (Also available on cassette, $10) *CD Review* 9/8 Apr.'90
DDD 60m '89 **GPA01 $18**

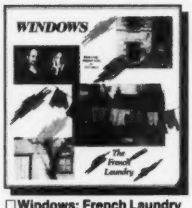
☐**Bob's Diner**
This hot new group's music is a great contemporary mix of the spirit of jazz, the earthiness of R&B, and the danceability of rock. The sound is a blend of the Crusaders, Steely Dan, and Weather Report. Songs include "Cherry Coke," "See You at the Diner," "Over Easy," and "Happy Waitress," just to name a few.
CD Review 8/9 Apr.'90
DD 58m '89 **DMP471 $18**

☐**Victor Feldman's Generation Band: High Visibility**
Victor Feldman is well respected for his talent on vibes and marimba, as well as his acoustic piano and synthesizer work. His band is composed of such notables as Tom Scott, Max Bennett, and Dean Parks. (Other discs available: *Soft Shoulder* [TBA8054], *Secret of the Andes* [TBA8066], *Rio Nights* [TBA225].)
AAD 42m '89 **TBA208 $12**

☐**Grant Geissman: All My Tomorrows**
Joined by a nine piece band including saxophonist Sam Riney, Grant plays classical, electric, acoustic, and 12 string guitars in this diverse set of pop/contemporary jazz selections. This live-in-the-studio recording is guaranteed to turn you into a true Geissman fan! His previous disc *Showman* is also available [TBA224].
ADD 46m '88 **TBA241 $12**

☐**Hermeto Pascoal: Hermeto Pascoal E Grupo**
The originality and versatility of this musical genius is remarkable. With this album you can see why, in Brazil, Hermeto is known as 'The Wizard of Sounds.' [HAP5005] and [HAP5007] are also available.
ADD 38m '89 **HAP5009 $15**

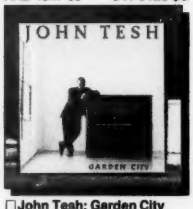
☐**Import Export: First Time Out**
An exciting musical project featuring music performed by an ensemble of New York's finest musicians. Originally composed on computer and synthesizer by Red St. John, transformed with arrangements by Byron Olsen.
". . . rich instrumental offering on a sonic silver platter."
—*Cash Box*.
ADD 41m '88 **FOC23501 $15**



☐**Windows: French Laundry**
Like the music of such contemporaries as David Sanborn, David Benoit, and Kenny G., Windows' music defies existing labels. A little bit of jazz bordering on new age with soft pop influences, the melodic tunes evoke a whole new category, perhaps best called eclectic jazz.
CD Review readers—7.8/8.8
ADD 42m '89 **CYP0124 $12**

☐**Tim Weisberg: Outrageous Temptations**
Flute player Tim Weisberg collaborates with instrumental greats David Benoit, Jeff Porcaro, Steve Lukather, and Lee Sklar on this new disc. Includes one vocal with Amy Holland. *The Daily Breeze* places his music "somewhere between new age and fusion."
ADD 43m '89 **CYP0123 $12**

☐**Brian Gallagher: Coming Home**
This is a warm and exciting showcase for a young, talented musician. Influenced by David Sanborn, Spyro Gyra, Jeff Lorber, and Michael Brecker, Brian began to develop his own unique sound. With the diversity and range shown on *Coming Home*, there is no question that he has a bright future.
AAD 45m '89 **CYP0126 $9**



☐**John Tesh: Garden City**
Tour De France, John's first disc, earned him an Emmy award, and he was recently voted *Keyboard* magazine's Best New Artist of the Year. This predominantly keyboard oriented disc includes a couple of collaborative efforts, featuring such notables as Toots Thielmans, Michael McDonald, and Tom Scott.
DDD 40m '89 **CYP0133 $12**

Steve Makowski: Mars
Jazz fusion featuring Dave Liebman, Kent Jordan . . .
ADD 36m '88 **NEB5004 $15**

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CAJUN

☐**Queen Ida: Caught in the Act**
The infectious rhythms of the bayou are captured before a responsive San Francisco audience. Zydeco music has been likened to an infectious musical potato chip. Hear it once and you'll crave more!
AAD 37m '88 **GNP2181 $12**

☐**Beausoleil: Bayou Cadillac**
The best of cajun music today from America's premiere cajun band. The title cut is a medley of what Buddy Holly might have done in New Orleans with help from Bo Diddley and borrowings from "Iko Iko," the Mardi Gras Indian song. "Rolling Pin" was first sung by Sidney Brown, one of the early Cajun accordion makers. Plus ten more cuts.
ADD 44m '89 **RND6025 $15**

☐**Buckwheat Zydeco: Waitin' for My Ya Ya**
This Grammy-nominated disc is considered by many to be Buckwheat's strongest to date, with tight, compelling performances that include some truly manic grooves. The title track was a major hit in Buckwheat's home territory. Includes one bonus cut.
AAD 44m '88 **RND2051 $15**

☐**Nathan & the Zydeco Cha-Chas: Steady Rock**
Queen Ida look out! Here's a strong, tradition-based sound from the "zydeco man of the future." As one the most promising artists to emerge thus far in the new generation of up-and-coming zydeco talent, Nathan maintains and expands the rich traditions of Creole music.
AAD 53m '89 **RND2092 $15**

☐**The Neville Brothers: Nevillization Volume I**
The first family of New Orleans music will make you tap, sway, and dance to a unique blend of rock'n'roll, R&B, doo-wop, jazz, funk, gospel, and Mardi Gras parade music. Includes "Fever," "Tell It Like It Is," and others. (*Vol. 2* [SPT9115] also available.)
AAD 43m '88 **SPT9108 $18**

COUNTRY/FOLK

☐**David Schnaufer: Dulcimer Plays Deluxe**
David Schnaufer plays mountain dulcimer better than anyone alive! In this 26-song CD, David and top Nashville players present 11 sparkling new originals and showcase fresh arrangements of classic American songs.
AAD 72m '89 **SFL3 $18**

☐**Barry & Holly Tashian: Trust in Me**
Tight, attractive duets, contemporary music at its most appealing—the Louvin Brothers by way of Buddy Holly—from Barry Tashian of Emmylou Harris's Hot Band and his wife Holly.
AAD 34m '89 **NRE5001 $18**

☐**The Shaw Brothers: The Shaw Brothers Collection**
This collection of great songs tells the story of the talented Ron and Rick Shaw, who have been performing for more than 25 years. Individually or together, they have performed in the Brandywine Singers, the Pozo Seco Singers, and the Hillside Singers, who recorded the famous *Coca Cola* song, "I'd Like to Teach the World to Sing." *CD Guide* 8/8 J/A '87
ADD 53m '86 **FKE2041 $15**

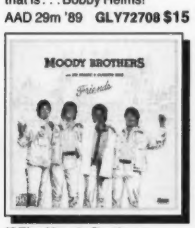
☐**White Mountain Singers: Best!**
A collection of 26 of the very best songs by one of the country's most popular folk groups. *CD Review* 8/9 July '88
AAD/DDD/ADD 72m '87 **FKE2059 $15**

☐**Kingston Trio: Stereo Concert Plus**
All the excitement and energy of the original concert is captured on this historic 1958 recording. *What CD*—9/8 Spring '87
ADD 55m '86 **FKE2037 $15**

☐**Steve Fiott and Friends: Feel the Magic**
Steve Fiott and Friends take you on a magical journey through popular music from rock to folk, cajun to classical and beyond! There's something for everyone on this great album.
ADD 50m '89 **FKE2070 $15**

☐**Sylvie and Her Silver Dollar Band: Warm Like a Fire**
Sylvie has burst onto the recording scene as one of the most explosive entertainers to come along in years, as evidenced on "Touch, Don't Look." Yet she can turn soft and tender on such compositions as her own "I'm Coming Home." Make way for Sylvie!
AAD 27m '89 **GLY72709 $15**

☐**Bobby Helms: This Song's for You**
Included on this disc are two of Bobby's gigantic million sellers, "Fraulein" and "My Special Angel," as requested by his many fans all over the world. Enjoy the pure genius that is . . . Bobby Helms!
AAD 29m '89 **GLY72708 $15**



☐**The Moody Brothers: Friends**
Recorded in Prague, gone "gold" in Europe, and labeled "the International Collaboration of the Year" by *Billboard*, this disc features Jiri Brabec (Eastern Europe's first rock and roll artist) on piano and John Hartford on banjo.
ADD 40m '88 **LAM10182 $15**

☐**Carlton Moody and the Moody Brothers**
Featured often on the *Nashville Network*, this family group has built an international following with their unique blend of country, folk and rockabilly music.
ADD 44m '87 **LAM10157 $15**

☐**The Moody Brothers: Cotton Eyed Joe**
"While the rest of the contenders (for the Grammy) have widespread name recognition, and most have major label support, these North Carolina tarheels have none of the above. Their nomination is the refreshing result of only one thing—talent!"
—*The Tennesseean*
AAD 35m '85 **LAM10116 $15**

☐**Billy Scott: Billy Scott**
From his R&B classics with the Georgia Prophets, to his induction to the BMA Hall of Fame, Billy Scott moves on with his debut album, featuring the hits "Until This Night" and "Big Rear Window."
AAD 35m '89 **LAM10201 $15**

☐**Woody Guthrie: Dust Bowl Ballads**
The *Dust Bowl Ballads* represent Woody Guthrie at his best, both writing and singing. Includes "Vigilante Man," "Pretty Boy Floyd," "I Ain't Got No Home," others.
AAD 44m '88 **RND1040 $15**

☐**Ricky Skaggs: Family and Friends**
You know Ricky Skaggs and his credentials as an instrumentalist, vocalist, and interpreter of note. This disc, however, is somewhat of a departure for him with its musical context of friends and family rather than hired studio players. *CD Review* 8/8 Mar.'87
AAD 30m '86 **RND0151 $15**

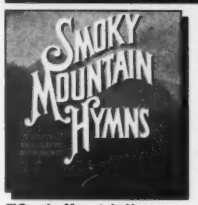
☐**Lester Flatt & Earl Scruggs: The Mercury Sessions, Volume 1**
This disc contains half of the 28 recordings the Foggy Mountain Boys made for Mercury Records between 1948 and 1950. These are newly dubbed copies of the original masters. The driving, exuberant sound of the band's formative years comes through!
CD Review 10/8 Feb.'88
AAD 36m '87 **RND18 $15**

☐**Cathy Fink: When the Rain Comes Down**
Cathy Fink just gets better and better! From a folk and acoustic performer, she has gone on to become one of the leading lights in quality children's music in this country. She comfortably travels through such diverse genres as rockabilly, rap, calypso, and folk favorites.
AAD 40m '88 **RND8013 $15**

☐**Yankee Ingenuity: Heatin' Up the Hall**
For over 10 years, Yankee Ingenuity has run its own contra dances in New Hampshire, drawing dancers from all over New England. They perform both traditional and newly written tunes on old and new instruments.
AAD 42m '89 **RND038 $15**

☐**Ben & Jerry's Newport Folk Festival, '88 Live**
This recording features the biggest names in folk music: Richard Thompson, Doc Watson, Cheryl Wheeler, Queen Ida, Taj Mahal, Moses Rascoe, Bill Morrissey, Patty Larkin, Tom Paxton, Shawn Colvin, Holly Near, Nashville Bluegrass Band, Happy & Artie Traum, and Dr. John. If you missed the festival, or even if you were there, don't miss this disc! *CD Review* 8/8 Dec.'89
AAD 51m '89 **ALC105 $15**

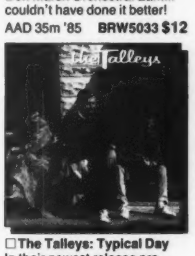
RELIGIOUS



☐**Smoky Mountain Hymns**
There's no place more peaceful and refreshing than the Great Smoky Mountains, and this best-selling collection of beautiful folk hymns performed on authentic instruments takes you there!
ADD 30m '89 **BRW5137 $12**

☐**Quiet Streams: Music to Restore the Soul**
Feel tranquility cascade around you as you rest in these quietly powerful hymns of faith. Includes "How Firm a Foundation," "There Is a Balm in Gilead," and many more.
AD 47m '89 **BRW5214 $12**

☐**Beside Still Waters**
Twenty-two golden hymns of faith featuring Jon Clarke on panpipes, accompanied by the Don Marsh Orchestra. Zamfir couldn't have done it better!
AAD 35m '85 **BRW5033 $12**



☐**The Talleys: Typical Day**
In their newest release produced by Gary McSpadden, the Talleys sing Christian songs with a wide range of accompaniments including Bela Fleck on banjo and Mark O'Connor on mandolin and fiddle.
ADD 37m '89 **WRD978630 $15**

☐**The 2nd Chapter of Acts: With Footnotes in the Volume of the Book**
This extended length CD contains the group's entire first two landmark albums. Born out of the spiritual awakening of the early '70s, these 24 original songs uncover some of the foundations of contemporary Christian music.
AAD 74m '89 **WRD16704 $18**

☐**Spectrum: The Colours Sampler**
Spectrum appropriately names this rainbow sampling. This array of *Colours* delights you with the selected piano, guitar, and keyboard pieces performed by some of today's most respected Christian musicians.
AAD 45m '85 **WRD14783 $15**

☐**Russ Taff: The Way Home**
Russ Taff's vocal performances and unforgettable recordings have made him one of the best-selling male artists in contemporary Christian music. His trumpet-like voice emerges as if from black and white into living color in this upbeat new disc of outstanding musical range and emotional depth.
AAD 48m '89 **WRD688061 $15**

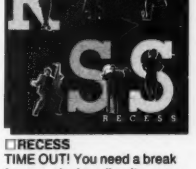
☐**Our Hymns**
What happens when Amy Grant, Russ Taff, First Call, Petra, Michael W. Smith, Take 6, Bruce Carroll, Phil Keaggy, Wayne Watson, and Kim Boyce get together to sing hymns? A powerful, moving collection results, one that carefully preserves the heart of sacred hymns while infusing them with a high-spirited vitality.
AAD 37m '89 **WRD910760 $15**

☐**The Praise Band: You Are So Faithful**
The Praise Band shines with contemporary praise and worship music that will lift hearts all over America. The approach is simple, personal and heartfelt in the acoustic and sensitive arrangements of classic songs of praise.
AAD 36m '89 **WRD28867 $15**

☐**Morgan Cryar: Stand Up and Shout**
Full of the pop/rock music that made Cryar a best-selling debut artist in 1985, this CD is flavored with touches of today's popular pop/folk instrumentation and Morgan's smooth, pure vocals and lyrics. His roots in rock 'n' roll give him a sound that is rich in texture with plenty of soul.
AAD 37m '89 **WRD4672 $15**

☐**Sandi Patti: The Friendship Company**
Without exception the most recognizable name in today's Christian music, Sandi Patti is synonomous with hit records of the highest quality. Sandi's love for kids is expressed here in an album that is sure to be embraced by the young and the young at heart. Fun! Moving! Exciting!
AAD 38m '89 **WRD905960 $15**

☐**Harlan Rogers & Smitty Price: Hymns In Colour**
Here's a collection of some of the tried and true traditional hymns of the Church, now sensitively performed on piano and electric keyboards as only this duo can.
AAD 43m '89 **WRD26967 $15**



☐**RECESS**
TIME OUT! You need a break from musical mediocrity—you need *RECESS*! These six, wild and crazy guys from Chicago will give you an education in creative energy and Christ-centered pop music with concrete messages for today's teens.
AAD 46m '89 **WRD4372 $15**

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POP/ROCK

☐**New Potato Caboose: Promising Traveler**
With influences ranging from unbridled rock to jazz, folk, funk and reggae, NPC offers classic American sound with a vital new groove. The party car is at the rear of the train. All aboard!
ADD/DAD/DDD 50m '89 **RYK10116 $15**

☐**Jerry Jeff Walker: Live at Gruene Hall**
On a cool night in December 1988, Jerry Jeff got some friends together for a concert at Texas' oldest dance hall. That concert in its spontaneous and genuine setting is now available on this disc.
AAD 44m '89 **RYK10123 $15**

☐**Bruce Cockburn: Further Adventures of**
Acoustic guitar with an electric band playing "The Laughter Song," "Can I Go With You," "Outside a Broken Phone Booth With Money in My Hand," "Rainfall" and others.
AAD 43m '88 **ESD8018 $18**

☐**Petula Clark's Greatest Hits**
Sixteen original hits of the '70s in memorable performances by England's brilliant vocalist. Many of these were #1 on the charts, world-wide, and made Petula Clark a star. You're sure to remember "Downtown," "Don't Sleep in the Subway," "I Know a Place," and others.
AAD 48m '86 **GNP2170 $12**

☐**Bing Crosby: The Radio Years**
Bing Crosby at his relaxed best on his radio shows, featuring guest co-appearances by Rosemary Clooney, the Andrews Sisters, Gary Crosby, Connee Boswell, Helen O'Connell, plus Lauren Bacall and Dick Powell. All of these authorized archive recordings are derived from Mr. Crosby's private tape library.
AAD 50m '87 **GNP9051 $12**

☐**Surf and Drag Vol. 1**
It's a 20-track wild beach hoot with Gary Usher, the Four Speeds, Donna Loren, Jan and Dean, and more. You'll dig the 'Rat Fink' full color cover by Ed 'Big Daddy' Roth and the intense sound quality from the original masters, unreleased cuts, and more first time true stereo . . . Egad!
CD Review readers—7/7.3
AAD 46m '89 **SUN11003 $15**

☐**Bobby Darin: As Long As I'm Singin'**
Subtitled *Rare 'n' Darin No. 1*, this 22-track CD features live Bobby Darin performances of such classics as "Mack the Knife," "You're Nobody Till Somebody Loves You," and "When the Saints Go Marchin' In."
AAD 60+m '88 **STA1301 $15**

CLASSICAL

☐**Bach: Preludes and Fugues for Organ, Vol. IV**
Anthony Newman, organ
Features *Prelude and Fugue in E Minor "Cathedral," S. 533* and *Passacaglia and Fugue in C Minor, S. 582.*
CD Review 10/10 Dec.'87
DDD 42m '86 **NEW60004 $12**

☐**March On!**
Michael Stairs plays march tunes on the historical 10,010 pipe organ at Longwood Gardens, using its wide range of stops and extensive percussion section to full advantage. Includes works by Sousa, Elgar, Coates, Wagner, Prokofiev, Verdi, Guilmant, others. Keep in step! (*Longwood Gardens, Vol. 1* [DTR 8305] also available.)
DDD 58m '90 **DTR8901 $15**

☐**W.A. Mozart: Works**
This disc contains some of Mozart's most widely known works, including *Symphony No. 35 ("Haffner")*, *Serenade in G Major (A Little Night Music)*, *Cosi Fan Tutte*, *Abduction from the Seraglio*, and *Marriage of Figaro* overtures.
AAD 50m '88 **KEM2005 $6**

☐**Ballet Music Vol. 1**
Music from the ballet stage including Borodin's *Polovtsian Dances* and *In the Steppes of Central Asia*, Tchaikovsky's *Nutcracker Suite*, *Romeo and Juliet* excerpts, and Chopin's *Polonaise*.
CD Review 8/8 Aug. '89
AAD 43m '88 **KEM2030 $6**

☐**Round-Up: Favorite Western Themes**
Cincinnati Pops, Kunzel; Frankie Laine
Themes and music from movie and TV westerns. Includes music from "Gunfight at the OK Corral," "Silverado," "Bonanza," "The Rifleman," and others. Don't miss Frankie Laine singing "Rawhide," Telarc's famous "digital cows," gunfights, etc. Note: *Happy Trails (Round-Up 2)* [TLC80191] is also available.
What CD? 10/10
DDD 62m '87 **TLC80141 $18**

☐**The Classic Euphonium**
Award-winning virtuoso Jean-Pierre Chevalier demonstrates the enormous possibilities of the remarkable brass euphonium by playing it in Handel's *Concerto in F Minor*, Mozart's *Concerto in B Flat (K191)*, and Danzi's *Concerto in F Major*.
DDD 44m '89 **ALB201 $15**

☐**Beethoven: Sonata No. 14 ("Moonlight"); Piano Concerto No. 1**
Radio Symphonic Orchestra, Anton Nanut; Dubravka Tomsic, piano
Beethoven's *Moonlight Sonata* is coupled with his *Concerto No. 1 for Piano*.
DDD 54m '88 **PLZ65008 $6**

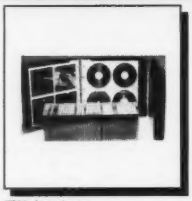
NEW AGE

☐**Crystal Wind: Inner Traveler**
This group creates mid- to up-tempo "world music" by weaving reggae, jazz, classical, new age and rock into a sonic tapestry.
AAD 49m '89 **HOC7024 $15**

☐**Peter Kater: Anthem**
"*Anthem* shows off the solo piano work of Peter Kater, who plays with a fluid, natural grace and creates a profoundly relaxing mood. The beauty of the music is perfectly captured in a rich acoustic ambience with a minimum of reverb and a maximum of intimacy."
—*CDR Yearbook* '90
CD Review 9/9 Aug.'89
DDD 47m '86 **NEB5002 $15**

☐**Bill Douglas: Jewel Lake**
This is a mainstream new age electro-acoustic album which includes Bill's melodic, space-creating ballads, Irish folk dances, and pieces inspired by traditional English church music and by an ancient Gaelic blessing.
CD Review 9/8, Aug.'89
AAD 49m '88 **HOS006 $15**

ACCESSORIES



☐**Univenture: Executive CD-Binder 40**
This handsome, high quality padded vinyl binder will organize 40 of your favorite CDs in 1 7/8" space. The discs are held securely in 'Safety-sleeve' pages along with their booklets, four discs per page. An index page is also included to log the contents of the binder. Color is charcoal. (12 3/8" X 1 7/8" X 11 1/2")
UNV40E11 $32

☐**DisClock**
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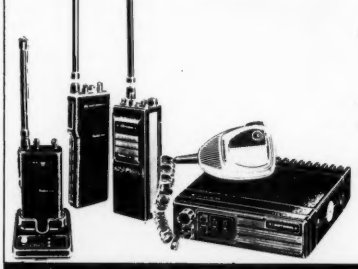

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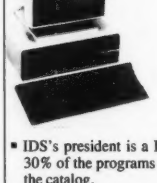

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The Video Generation

There has been a lot of discussion lately about ways to entice young people into ham radio. With all of the electronic distractions available these days, which do you think the typical teenager will choose: 1) Playing the latest video game on their Whizbang 2000 computer or 2) Working CW on the novice bands? Tough choice, but I imagine the computer will probably win out! We may have lost many potential new hams now that affordable home computers have found their way into most households.

If only we could enhance the use of computers through ham radio! Wouldn't it be great if there were a way to actually show your friends your latest computer program directly on their TV sets? Amateur Television (ATV) just might be the answer! With a ham radio license you can legally set up your own TV station and show off your latest computer wizardry!

How many of you have had trouble getting a new program to run or needed help figuring out your new computer? It's tough explaining the fine points of a program on the 2 meter rig or over the phone. If one of our local ATV group members needs an answer, he just pops the computer screen on the air and gets immediate feedback. We've spent hours demonstrating our latest graphics and quickly learning the fine points of each new software acquisition.

If new ham clubs can be started in schools (maybe as part of a computer club), it wouldn't take a lot to include an ATV station. If local ATV activity exists, you may only need a UHF antenna, a downconverter and a TV set to start watching it. Most schools have an audio-visual department who might loan a school ham club the necessary video camera, VCR and TV to start putting together a transmit station.

ShuttleVision

Many ATV repeaters and individual ATV stations retransmit live video from the space shuttle during each mission. This can be legally relayed from the NASA Select satellite feed received by any home satellite dish. This feed is on SATCOM F-2, channel 13 and shows mission activities from various NASA centers, as well as all video downlinks from the shuttle.

One of the goals of the upcoming Shuttle Amateur Radio Experiments (SAREX) will be to involve as many schools as possible. Over 4000 schools can tie into a special NASA phone line computer BBS to list out missions activities during each flight. Also, audio communications between the astronauts and mission control can be linked via 2 meters into many of these schools. The ultimate goal would be to actually relay the satellite video feed directly to the classrooms via ATV.

Spread the Word

A list of ATVers and ATV repeaters who relay shuttle video is being compiled so that interested schools can tune in. Here's your chance to help put shuttle video into the classroom. If you or your ATV group relays "ShuttleVision," please let us know the location and callsign of the ATV transmitter or repeater, output frequency, antenna polarity, and a local contact address or phone number. Send this information to Tom O'Hara W6ORG, 2522 Paxson Lane, Arcadia, CA 91007-8537, so that it can be included in a SAREX information package being sent to schools.

Figure 1. "ShuttleVision" via the Daytona Beach ATV repeater.

Amateur radio will be carried into space by the shuttle on two missions this year. On May 9th, Ron Parise WA4SIR will operate a packet TNC on 2 meters with a ROBOT QSO capability aboard STS-35. Also, voice contacts will be attempted with schools around the world.

Of particular interest to the ATV community will be the STS-37 mission scheduled for November 1st. Lt. Col. Ken Cameron KB5AWP will be looking for two-way SSTV, packet, and voice QSOs on 2 meters. In addition, selected ATV uplink stations will attempt the first live video transmissions to the shuttle. Due to bandwidth restrictions for space communications on the 70cm band, a special temporary authorization (STA) from the FCC is required. Only a limited number of ATV uplink stations will be approved for this event. These stations will be located at radio clubs at the various NASA space centers as well as at Motorola. Motorola supplied the 2 meter HT and the special dual-band antenna which will be mounted in the pilot's or co-pilot's window of the shuttle.

The goal of this part of the SAREX experiment is to send special video presentations up to the astronauts. VIP messages, greetings from the astronauts' wives, and educational messages, will be uplinked. Although QSOs with the general ATV community will not be made, you can participate with this effort by helping to distribute the satellite TV downlink. The NASA select satellite feed will be providing a good deal of coverage of the amateur radio activities during both missions and will be highlighting the ATV uplink transmission from the Johnson mission control center in Houston. If this experiment proves to be successful, we can expect future SAREX missions to carry ATV receive and transmit equipment for two-way QSOs with ATVers worldwide.

WEBERSAT Update

Digitized pictures from the onboard color CCD TV camera have been sent down from the orbiting WEBERSAT. The picture is relayed via packet data on 437.100 MHz and it takes two passes to retrieve all of the information. Currently they are sending down one new picture each day. Since the satellite is spinning and the field of view of the camera is 20 degrees, many of the initial pictures will be of open space until the spacecraft orientation with respect to the Earth can be predicted.

Figure 2. Computer screens transmitted from the balloon.

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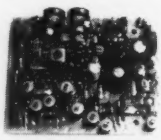

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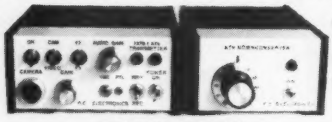

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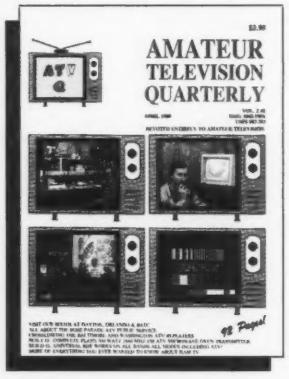

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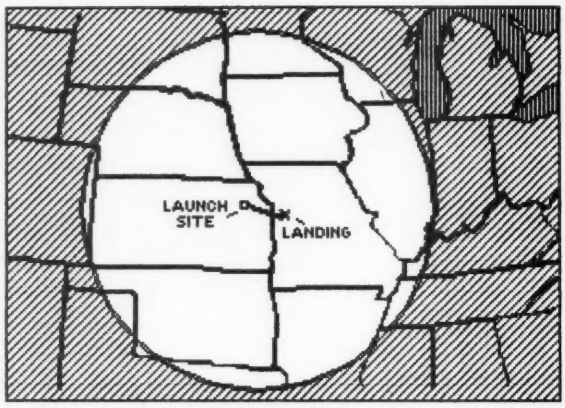

Figure 3. 393-mile range from Kansas City.

However, at this writing a few pictures of the Earth have been successfully received by the command station at Weber State College. A program called WEBERWARE 1.0 should be currently available to decode the raw packet data transmissions. You will need an IBM PC with at least an EGA display. This program is available from AMSAT, PO Box 27, Washington, D.C. 20044.

The ATV uplink experiment on 1265 MHz will be attempted this spring and summer. Here's your chance to have your ATV signal seen by hams all over the world! If you have at least 18 watts on 1265 MHz and an Az/El mounted antenna, please send your address and phone number to me at the above address, so that we may coordinate uplink contacts.

Kansas Balloon

Mike Bogard KDØFW started out the year with an exciting ATV balloon flight from the Kansas City area on February 10th. Mike put together a 3 watt ATV transmitter on 439.25 MHz with a P.C. 80 mW exciter into a Motorola MHW-710 power brick. This system was run at about half the power output in order to conserve battery life of the lithium cells. The video source consisted of 4 computer screens with a VDG-1 video ID displaying QSL information and pictures of Kansas complete with a farm scene.

Also included was a 50 mW, 2 meter transmitter on 144.34 MHz with a voice IDer made by Carl Lyster WA4ADG. Outside temperature was determined by the length of time between voice IDs through use of a thermistor sensor (gets down to −68 degrees at the higher altitudes!) and internal temperature was determined via the video screen timing. This was packaged in styrofoam, complete with an omnidirectional Big Wheel ATV antenna (W6OAL design) and a 2 meter, quarter-wave whip.

Mother nature decided to make things difficult and hit Mike with 20 knot gusts of wind during the hair-raising launch. At times, the 5-foot weather balloon was stretched out 20 feet, looking like a large cigar! Liftoff occurred at 1622 UTC from just west of Lawrence, Kansas.

Even if you're beyond the coverage of one of these flights, it's great fun to listen in on the excitement of the 40 meter balloon net. Bill WØZMR kept us informed of the balloon's flight progress. It sounded just like a space launch with the reception reports coming in from increasing distances. At the maximum altitude of 95,000 feet, the ATV signal was received in over seven states. The furthest reception was by a group from Denver who ventured out to the "highest" point in Kansas. From their vantage point on Mt. Sunflower, near the Kansas/Colorado border, W6OAL, AAØP and WBØTUB were rewarded with a nearly snow-free color picture at a 393-mile range!

Balloon packages tend to land in strange and "peculiar" locations. Sure enough, the payload parachuted down into the top of a 60-foot tree just south of Peculiar, Missouri! Thirteen chase vehicles converged on the scene in a matter of minutes. Paul W9DUU was close enough to actually see the parachuting package as it drifted down towards its landing site. After sawing down part of the tree with a chainsaw and shooting at the string a dozen times with a shotgun, Mike was finally able to loop a line around the package to pull it down for a soft landing.

These balloon events are a great way to get your whole group involved, and certainly seems to stir up more interest in ATV wherever they occur. Several ATV and packet balloons are planned this spring and summer. Watch your local packet BBS for information. Also, listen in to the ATV net on 3.871 MHz every Tuesday night at 8 PM for updates on balloon flights, WEBERSAT and finding local ATV activity. Stay tuned... 73

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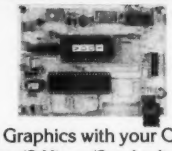

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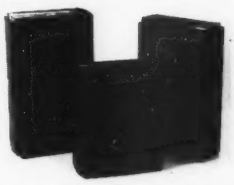

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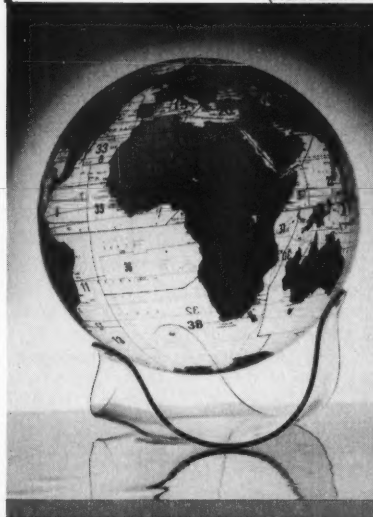

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The IC-970 comes fully equipped as an all-mode dual-bander for 144 and 440 MHz. You can operate the 1200 MHz band by installing the UX-97 band unit, or you can listen to what's happening in the world with the UX-R96 wideband receiver, receiving 50–905 MHz continuously. This unit can receive both main and subband audio simultaneously. Multiple scanning systems also function concurrently on the main and subbands.

This transceiver makes satellite communications easy. It automatically tracks uplink and downlink frequencies when the tuning control is rotated, and has 10 memory channels specially designed for quick satellite communications.

For price contact: *ICOM America, Inc., 2380 116th Ave. N.E., PO Box C-90029, Bellevue WA 98009-9029.* (206) 454–8155. Or circle Reader Service No. 201.

MFJ

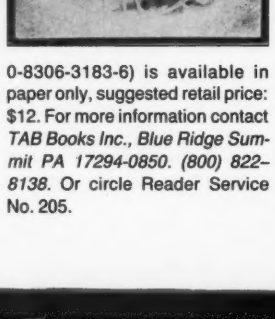
MFJ has released several new new miniature speaker/microphones for Kenwood, ICOM, Yaesu and other handhelds. These speaker/mikes are available with regular or "L"-shaped connectors. They measure just 2" x 1¼" x ¼" yet provide a first-rate electret mike element and a wide-range speaker for superb audio on both transmit and receive. They also have an earphone jack for private listening, a PTT button, a swiveling lapel/pocket clip and a lightweight retractable cord.

The price for each model is $25. Contact *MFJ Enterprises, Inc., PO Box 494, Mississippi State MS 39762. (601) 323–5869.* Or circle Reader Service No. 206.

TAB BOOKS

Talk to the World: Getting Started in Amateur Radio by James P. Dux K3JD and Morton Keyser N3MK is for anyone who wants to know what ham radio is all about but doesn't want to spend a lot of money finding out. It is designed to help beginners get started and stay involved. In addition to providing information and practical tips on obtaining a Novice license, the authors take the mystery out of the technical and procedural aspects of ham radio. Emphasizing what is practical, low-cost and effective, they describe in comprehensible language how to obtain and set up equipment, organize a ham shack, put up antennas, and understand the special jargon and operating protocols on the various bands and modes. Also included are a chapter on ham radio for the handicapped and a glossary.

Talk to the World: Getting Started in Amateur Radio (ISBN 0-8306-3183-6) is available in paper only, suggested retail price: $12. For more information contact *TAB Books Inc., Blue Ridge Summit PA 17294-0850. (800) 822–8138.* Or circle Reader Service No. 205.



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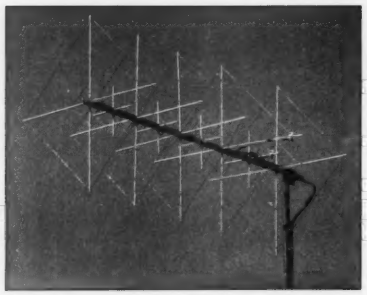
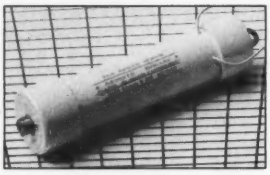


The Model DB2/70 dual-band quad antenna from Custom Antenna Systems is a compact, lightweight, high performance beam with five elements for two meter and nine elements for 70 cm. It is broadbanded, offers 12.5 dB forward gain on two meters and 10.5 dB on 70 cm, and has a front-to-back ratio of 20 dB.

The DB2/70 is only five feet long and uses a 1"–13/8" mast. It is end-mounted, making it easy to install using only a light rotor. The match system provides low SWR with a 50 ohm feed and a standard PL-259 connector. This beam needs only one feedline, but you can also feed both bands separately with a second feedline. The antenna weighs approximately 3½ pounds and will handle a wind load of 90+ MPH.

The Model DB2/70 is available for $110, plus S & H, from *Custom Antenna Systems, PO Box 17012, Munds Park AZ 86017. (602) 286–1236.* Or circle Reader Service No. 203.



THE RADIO WORKS

The RemoteBalun© from Radio Works provides a simple way to convert your 80 or 40 meter dipole to all-band operation, including the WARC bands. You can use ladder line to feed your antenna, mount the RemoteBalun outside the house, attach the ladder line to the balun, then route low-loss coax to your transmatch. This eliminates the inconvenience of getting the ladder line into your shack, offering you the convenience of balanced feeders plus the ease of coaxial cable.

The RemoteBalun system has a special twin-core design that overcomes core saturation, poor output balance, RFI, and signal distortion. The power rating is 1.5 kW in low duty cycle CW and SSB applications.

The price is $27. Optional low-loss interconnect coaxial cables are available with PL-259 connectors installed. A complete all-band Universal© antenna and RemoteBalun are available for $60. Contact *Radio Works, Box 6159, Portsmouth VA 23703. (804) 484–0140.* Or circle Reader Service No. 204.

SURPLUS SALES OF NEBRASKA

Don't tie up your PC for packet when you can dedicate an RCA "APT" terminal to the job. Plus, when you're not hamming, you can use the built-in modem to access information services like CompuServe or a local bulletin board. Other features include video or RF outputs (allowing you to use either a monochrome monitor or a TV set), a parallel printer port, an RS-232 interface (DB25) for direct connection to the packet controller, acoustical coupler input and auto log-on.

This terminal, originally priced at $500, is now selling for $75 from *Surplus Sales of Nebraska, 1315 Jones Street, Omaha NE 68102.* (402) 346–4750. Or circle Reader Service No. 202.

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PACKET TALK

Latest in Digital Hamming

Edited by the B.H.L.N.

Smart Packet Software

This month let's look over some *smart* software for your packet station. One very versatile terminal/communications program is LAN-LINK for the IBM PC and compatibles.

LAN-LINK is a very comprehensive program which will work with a number of different TNCs. Many different configurations can be established via the colorful menu screens. Packets are displayed in different colors depending on whether they are monitored headers or ones sent to you during a connect. Also during a multi-connect the different streams can be displayed in distinctive colors.

For those of you who look with bewilderment at all the different parameters that can be changed on your TNC, fear not! When first started, LAN-LINK will automatically set up your TNC for the optimum configuration for either VHF or HF.

One particularly nice feature is the automatic BBS download function. Instead of waiting for hours to log onto your local BBS, you can set up LAN-LINK to access the BBS when it's clear, to read your mail and look for special items (such as AMSAT bulletins), and to log off the system without so much as one keystroke. You can even set it up to look for your call in the BBS mail beacons. If you have mail waiting for you, LAN-LINK will automatically log onto the system and download your messages.

Each packet contact is also automatically entered into a logbook section for future reference.

Other modes, such as AMTOR, are also supported, as well as a robot QSO mode which allows your computer to automatically work and log stations.

SAREX Features

Version 1.55 of LAN-LINK has a number of features specially designed for ground stations trying to work SAREX, copy telemetry from the Microsats, and do other special activities as described below:

The Attack or "Go For It" Mode. If the Attack Mode is set, LAN-LINK will issue a connect request to WA4SIR-1, or any other desired station, whenever a packet sent to or from it is heard. Be careful using this feature, as it has the potential to cause a great deal of QRM. It can also be cleared by another station connecting to you and telling you to ":QRT:".

Blind Connect Scheduler. In case you think that the ROBOT may be turned on in the middle of a pass before you hear a packet, you can give LAN-LINK the start time and the end time of the pass, and the time interval between the connect/call attempts. At the given start time, LAN-LINK will issue a connect request, and keep trying until either it succeeds or the pass ends. The first connect that goes through will inhibit the scheduler.

Telemetry Capture. LAN-LINK can also be configured for telemetry reception so as to capture-to-disk any packets addressed to or from the SAREX callsign. The capture-to-disk file is opened by a packet header containing the SAREX call, WA4SIR-1, and closed by another packet header not containing that call. Packet headers are considered to be lines with a ">" character in them. LAN-LINK thus considers both of the lines below as packet headers.

N4QQ* >G3ZCZ
N4QQ BBS>

LAN-LINK users may also set up these features for copying telemetry from the Microsats.

Another smart program of particular interest to Microsat users is a program called WHATS-UP. The documentation file is, of course, called WHATS-UP.DOC. This program takes transmissions from the Microsats and displays the decoded telemetry in real-time. It can also use previously stored data to display the telemetry in a playback mode.

LAN-LINK and WHATS-UP are available for $35 each from *Joe Kasser G3ZCZ, PO Box 3419, Silver Spring MD 20918.*

Chess, Anyone?

Whether you are a Grand Master or an occasional player, you will enjoy Packet Chess 1.0. Packet Chess runs on an IBM PC or compatible with an EGA or VGA card. An AMIGA version is also available.

Packet Chess starts in a terminal mode which allows you to set up communications with your TNC and establish a connect with your opponent. To start the game, you hit the ESC key, which displays the high resolution color chessboard on your CRT. The player who hits the ENTER key first will play the white pieces and make the first move. This causes the black side to appear on the opponent's screen.

Pieces are moved by placing a white box around them using the cursor keys. Illegal moves are not allowed, as well as moves putting yourself into check. After you move a piece, the information is relayed via packet to your opponent, and the piece is moved on his screen. You can't move a piece unless it's your turn.

There is a window area below the chessboard for messages. This will tell you if it's your move or whether you're in check. It can also be used to display messages from your opponent. To the left of the chessboard is a menu area describing function key commands. By hitting function key F1, you can send comments to your opponent such as: "Your move, if you DARE!!". This is a great way to give you that psychological advantage.

Other function keys allow you several options, such as adding or deleting pieces, or changing sides. You can save an existing game to play at a later date as well.

Packet Chess 1.0 is available for $29 from the *Great Circle Map Co., PO Box 691401, San Antonio, TX 78269.* 73

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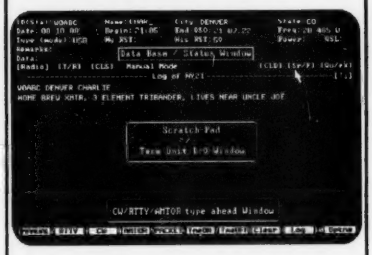

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> Scan Radio based on Log search. Change freq, mode, VFO, TU mode, etc, with mouse or keypress. (MFJ's interface required)*

Note: Aries-1 available for $64.95 + Shipping

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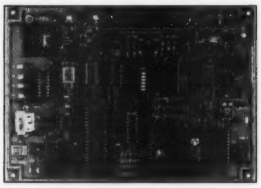

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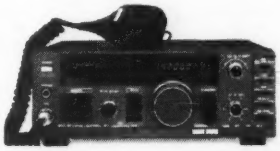

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Becoming an experienced and knowledgeable DXer doesn't happen overnight. It helps to learn good DXing tools.

DX Techniques

Last month's discussion of pile-up techniques just barely scratched the surface. The technique described is of prime importance. There are more techniques that will make DXing easier and reduce your level of frustration while you add more country notches to your gun. Several books currently in print discuss DX operating techniques. My favorite is *The Complete DX'er* by Bob Locher W9KNI. Bob presents the techniques of DXing in a narrative style that is informative and enjoyable. (Order from your favorite dealer or direct from Idiom Press, P.O. Box 583, Deerfield IL 60015.)

DX Nets

Have you ever wondered about the frequency and time of operation of "Snooky's Net," or when the "14222 Net" is active? If so, then Dieter OE2DYL can help you. The 1990 edition of *DX-Nets Around the World* compiled by OE2DYL contains information about more than 100 active DX nets. To order *DX-Nets* send US$3 or 9 IRCs plus a self-addressed envelope (SAE) to Dieter Konrad OE2DYL, Rosengasse 1, A-5050 Salzburg, Austria.

QSL Routes

QSL routes are listed by all DX bulletins, but there are several publications that specialize. Addresses of three such publications were listed in my March 1990 column.

DX Bulletins

DX bulletins provide valuable information about DXpeditions, new countries and prefixes, QSL routes, where and when the "rare ones" are operating, and much much more. The most popular weekly DX publications are listed below with the editor's callsign in parentheses. All but *Les Nouvelles DX* are written in English. *DX News Sheet* (G4DYO), Radio Society of Great Britain, Lambda House, Cranborne Road, Potters Bar, Herts EN6 3JE, England. *Inside DX* (N2AU), 436 N. Geneva St., Ithaca NY 14850. *DX-press* (PA3CXC), c/o VERON, P.O. Box 1166, 6801 BD Arnhem, Netherlands. *The DX Bulletin* (VP2ML), P.O. Box 50, Fulton CA 95439. *QRZ DX* (W5KNE), P.O. Box 832205, Richardson, TX 75083. *Les Nouvelles DX* (F6AJA), 515 rue du Petit Hem, F-59870 Bouvignies, France.

Country, Prefix, Zone Lists

For the new and born again DXer the addition of new countries, the proliferation of special prefixes and new ITU callsign allocations can be confusing. It is confusing even to some experienced DXers! However, there are several publications available that can help to bring order to the confusion. The "official" list of DX countries, on which most DX awards programs are based, is *The ARRL DXCC Countries List*. Included with the list of DXCC countries are the rules for the DXCC awards, DXCC countries list criteria, a check list for the DXCC awards, and more. The list is available for $1.00 from The ARRL, 225 Main Street, Newington CT 06111.

One of the finest DX aids available anywhere is The 15-page *DXNS Radio Amateur Prefix-Country-Zone List*. This list is one of several DX-related publications compiled and published by Geoff Watts, former editor of the RSGB's *DX News Sheet* (1962-1982). According to Geoff's description, this list, arranged in order by prefix, puts all information for each country on one line: normal prefix, special prefixes, ITU callsign block, continent, DXCC status, CQ and ITU zones. In addition, the list contains information about obsolete prefixes used during the past 10 years, Antarctic stations, DXCC notes, etc. Order from Geoff Watts, 62 Belmore Road, Norwich, NR7 OPU, England. Cost: US$3.00 or 6 IRCs for the double-sided version; US$4.00 or 8 IRCs for the single-sided version. I heartily recommend this publication. My copy is ragged and worn from heavy use.

Also available from Geoff Watts is the 14-page *DXNS DXCC Countries Guide* which lists present and past prefixes back to 1945, previous names of countries and other useful notes. The price is the same as listed above.

Awards Directories

Chasing DX and working new countries is a fine hobby, but simply working new countries and collecting QSLs from around the world is not enough—the name of the game is **AWARDS.** In addition to the popular DX awards such as DXCC, WAZ, WPX, etc., many other attractive awards are available. If you are interested in collecting "wallpaper" then you should consider acquiring one or more awards directories. I am aware of two awards directories currently being published: *The K1BV DX Awards Directory* and *The International Awards Guide Book* compiled by YBØWR.

The 1989 edition of *The K1BV DX Awards Directory* contains details of more than 1,000 awards from 100 countries plus suggestions for earning and applying for awards, etc. The 1989 edition contains 170 loose-leaf pages and is available for $15.50 postpaid in the US, US$15.00 overseas by surface mail or US$19.00 overseas by airmail. Order from Ted Melinosky K1BV, DX Awards Directory, 525 Foster Street, Suite 1001, South Windsor CT 06074.

The International Awards Directory by YBØWR is a bound book (422 pages) which lists more than 750 awards, 634 of which are in actual color. If you are not already hooked on awards, just looking at some of the beautiful awards in YBØWR's book will certainly get your attention. Order from M. S. Lumbangaol YBØWR, Jl. Garuda No. 62, Jakarta 10620, Indonesia. The cost is US$37.00 (surface mail).

In next month's column I'll discuss prefixes—new, old and special. Plus, how to understand Soviet callsigns. 73

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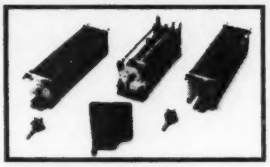

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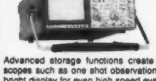

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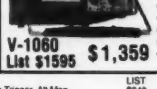

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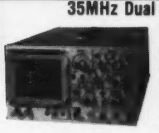

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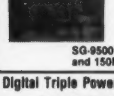

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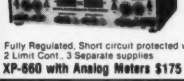

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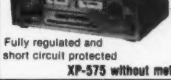

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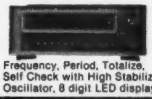

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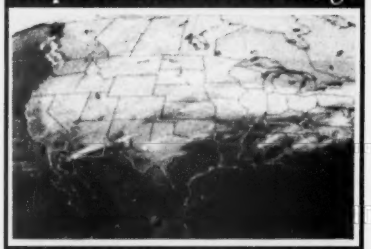
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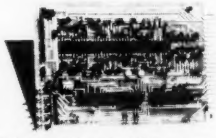

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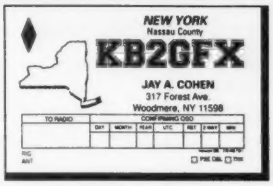

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SPECIAL EVENTS

Ham Doings Around the World

Listings are free of charge as space permits. Please send us your Special Event two months in advance of the issue you want it to appear in. For example, if you want it to appear in the June issue, we should receive it by March 31. Provide a clear, concise summary of the essential details about your Special Event.

MAY 4–6

SIERRA VISTA AZ The Cochise ARA will hold its annual Hamfest at the club training facility. All ham radio, computer and related businesses are invited to attend. No charge for tailgaters. VE Exams. Overnight RV camping (no hookups) available to club members. Talk-in on 146.52 or 146.76 (−.6). Handicap facilities available. Contact *Robert Hollister N7INK 602–378–3155 after 6 PM* or write to *CARA, PO Box 1855, Sierra Vista AZ 85636.*

MAY 5

MASSACHUSETTS QSO PARTY Sponsored by the Wellesley ARS from 0000Z Saturday–2359Z Sunday. 160–10 meters. CW and phone. No crossmode, crossband, packet or repeater contacts. Frequencies: CW 15 kHz up from the bottom of the General bands. SSB 25 kHz up from the bottom of the General phone bands. Novice and Technician CW and SSB bands. Exchange RST and QTH (county for MA stations) state, province, or DX country for others. Work stations once per band and mode. MA to MA contacts allowed. Points: 1 per phone contact, 2 per CW contact. Contacts with club station W1TKZ count 5 points. MA stations multiply total QSO points by number of states, etc., and MA counties worked for final score. Others multiply total QSO points by number of MA counties (max 14) worked. Certificates awarded. Mail logs by 6 June to *Wellesley ARS, MA QSO Party, 211 Washington St., Wellesley MA 02181.*

BEMIDJI MN The Paul Bunyan ARC will hold its annual Hamfest at the V.F.W. Club from 8 AM–3:30 PM. Dealers, exams and flea market. Talk-in on 146.13/.73. Contact *Carol Johnson KA◉AJD, 1503 Jefferson Ave. SW, Bemidji MN 56601. 218–751–7920.*

CEDARBURG WI The Ozaukee Radio Club will hold its 12th annual Swapfest on Jct Highway 60 and I, 20 miles north of Milwaukee from 8 AM–1 PM. Exhibitor set-up at 7 AM. $3 per 4' table. Admission $3 at the door. Talk-in on 146.37/.97, .224.18/222.580 and 146.52. SASE to *ORC Swap, N5415 Crystal Springs, Fredonia WI 53021. 414–692–2329.*

OWEGO NY Southern Tier ARC will hold its Hamfest at the Marvin Park Fairgrounds from 8 AM–4 PM. Indoor and outdoor flea markets, VE exams. Admission $4 at gate; tailgate $6. Tables $15. 31st annual Banquet is $15 per person in advance, (includes general admission). Contact *STARC, PO Box 7082, Endicott NY 13760.*

DULUTH MN The Arrowhead RAC of the Duluth/Superior area proudly presents SWAPFEST '90, which will be held at the First United Methodist Church from 10 AM–3 PM. Admission $4. 4' tables $5. Talk-in on 146.34/.94. Contact *Duane Flynn KB◉LC, 4907 Peabody Street, Duluth MN 55801. 218–525–4580.* There will also be License Exams held at the Government Services Building. For pre-registration or info contact *John Crow KA/0SYN, 1365 Roland Road, Cloquet MN 55720. 218–879–5356.*

MAY 5–6

GREENVILLE SC The Blue Ridge ARS proudly sponsors the Greenville Hamfest and Electronic Flea Market at the American Legion Fairgrounds from 8 AM–5 PM Saturday; 8 AM–3 PM Sunday. Advance admission $4, $5 at the gate. For tickets and information send SASE to *Blue Ridge Amateur Radio Society, PO Box 6751, Greenville SC 29606.*

MAY 6

DALTON MA The NOBARC Mayflea will be held at the Dalton American Legion starting at dawn. Admission $1, XYLs, YLs and Kids free. Talk-in on 146.91. For info call *413-458-8452.*

MAY 12

MANITOWOC WI The Mancorad RC will sponsor their Hamfest at the Manitowoc county Expo Center from 8 AM–5 PM. Flea market, ham and computer equipment, VE exams. Camping available via *Manitowoc Co. Expo Center, 414–683–4378.* Admission $2 in advance, $3 at the door. Tables: 8' $3, with electric outlet $5. Talk-in on 147.03/.63 or 146.01/.61. Send SASE to *Mancorad RC, PO Box 204, Manitowoc WI 54221-0204* or call *(days) "Red" 414–684–9097; (nights) "Lou" 414–682–2557.*

CLINTON IA The Clinton ARC will hold "Hamfest 90" at the Iowa National Guard Armory. There will be a limited outside area for trunk sales. Gate opens at 8 AM. Tickets are $3 advance, $4 at the gate. Tables $5. VE Exams. Talk-in on 145.43 repeater. Contact *Darryl Petersen KD◉PY, R.R. #1 Box 84, Bryant IA 52727. 319–682–7359.*

JEFFERSON WI The Tri-County ARC will hold its annual Hamfest from 8 AM–2 PM at the Jefferson County Fairgrounds. This will be an indoor/outdoor event. Indoor space requires reservation ($3 per table). Advance admission is $2.50, $3 at the door. Free parking. Talk-in on the 144.89/145.49 repeater. Send an SASE to *TCARC, PO Box 112, Jefferson WI 53549.*

MAY 13

WESTMINSTER MD The 2nd annual Carroll County Computer Fest and HAMBOREE will be held at the Carroll County Agricultural Center, sponsored by Summit ARA. Doors open at 8 AM. Admission is $4. Handicap parking. Tailgating starts at 6 AM, $5. Inside tables $8, including electricity. Talk-in on 224.68, 224.64, 146.52. Contact *Al Parker KS3L, c/o SARA, PO Box 341, Randallstown MD 21133 or call 301–747–2076.*

ATHENS OH The Athens County ARA will hold its 11th annual Hamfest at the City Recreation Center from 8 AM–3 PM. Admission is $4, spouses of hams free. Outdoor space free for tailgaters. Indoor space available by advance only. Talk-in on 145.15/.55. Contact *John Biddle WD8JLM, 80 Wonder Hills Dr., Athens OH 45701. 614–594–8901.* Or write to *Carl J. Denbow KA8JXG, 63 Morris Ave., Athens OH 45701.*

MAY 14

BOULDER CO There will be a VE Team Test at the American Legion at 7 PM. Pre-registration preferred. Contact *Barbara McClune N◉BWS, 303–530–1872.*

MAY 18–20

TULSA OK The 1990 Green Country Hamfest will be held at the Expo Square Pavillion. Advance admission is $5, $7 at the door. Tables are $4 in advance, $5 at the door. VE Exam pre-registration: *VE Exams Attn: KA5VIL Georgia, 5332 S. Irvington Ave., Tulsa OK 74135.* Pre-registration required for Saturday test. Send a form 610 with a check payable to ARRL-VEC for $4.95 and a copy of your license. We will not have a copy machine available at this site. Walk-ins permitted on Sunday. Exams are at 1 PM Saturday and 9:30 AM Sunday. Talk-in on 146.31/.91 (primary), 146.28/.88 (secondary). Open autopatch on 88 during Hamfest. Hamfest registration: *Green Country Hamfest 1990, PO Box 4283, Tulsa OK 74149-0283. 918–272–3081.*

MAY 19

MAYODAN NC The Snake Mountain Radio Assoc. will sponsor the 2nd annual Snake Mountain Hospitality Bash from 8 AM–4 PM at Farris Memorial Park. Free tailgating. Prize tickets $2. Tables $4. Talk-in on 147.390. Write with SASE to *Jim Phillips AA4QT, PO Box 648, Ridgeway VA 24148.*

EPHRATA PA Lancaster County Hamfest, sponsored by the Ephrata Area Repeater Society, Inc., will be held at the Ephrata Senior High School. Set-up at 6:30 AM. General admission at 8 AM. Handicap accessible. Amateur Exams from 9 AM. Entrance fee $4, tailgating $3, inside tables $6. Talk-in on 145.45, 146.52 and 444.65. Call *Tom Youngberg K3RZF at 215–267–2514 after 6 PM* or write *E.A.R.S., 906 Clearview Ave., Ephrata PA 17522.*

SPRINGDALE AR Hamfest 90, sponsored by the Northwest Arkansas ARC, will be held at the Community Building at the Rodeo Grounds located at East Emma. Doors open from 8 AM–4 PM. Free admission. Tables are $5 each. Advance table registration is a must. Tailgating is $4 per vehicle. Free parking. Talk-in on 146.76 (−.600). Contact *Mike Lorenz N8FJJ, Rt 2 Box 160A, Prairie Grove AR 72753. (501) 846–2516 evenings. Via packet, N8FJJ @ KA5BML.AR.USA.*

CADILLAC MI The annual Swap and Shop sponsored by the Wexaukee ARA will be held at the Cadillac Middle School from 8:30 AM–2:30 PM. Admission $3. Tables $6. Talk-in on 146.38/.98 repeater. Contact *John Craddock KX8Z, 616–797–5491* or write *Wexaukee ARA, PO Box 163, Cadillac MI 49601.*

COLORADO SPRINGS CO Pikes Peak Radio Amateur Association will hold its Swapfest at the Rustic Hills Mall. No entry fee. Wheelchair accessible. Tables $10 advance, $12 at the door. Contact *Rick WB7THT, 719–599–7665,* or write *PO Box 16521, Colorado Springs CO 80935.*

MAY 19–20

YAKIMA WA The Yakima ARC, W7AQ, is celebrating its 60th anniversary at the Queen Gym, Saturday from 9 AM–4 PM, Sunday 9 AM–1 PM. Features: Visiting Soviet Amateurs, Swap n Shop, VE Exams, Banquet & program, and consignment table. Advance Admission $5, $6 at the door. Tables $7 each. Talk-in on 146.06/.66. Contact *Yakima ARC W7AQ, PO Box 9211, Yakima WA 98909. Mary Wildman KB7AMF, 509–248–5007.*

HARTWELL GA Anderson, Hartwell and Toccoa A.R.C. will sponsor a Hamfest at the Lake Hartwell Group Campground from 7 AM–4 PM Saturday, 7 AM–2 PM Sunday. Talk-in on 147.330/.930–146.715/.115. Contact *B.J. Taylor WD4CUK, Rte 5 Senic Drive, Toccoa GA 30577; Carl Davis KY4T, College Ave., Hartwell GA 30643; Jones Beasley N4VNJ, Rte 2 Box 21, Lavonia GA 30553.*

MAY 20

OLD WESTBURY NY The Long Island Mobile ARC will hold a Hamfest at the New York Institute of Technology from 9 AM–4 PM. No advance, $5 at the gate. Exhibitors $8. Talk-in on 146.25/.85. Contact *Neil Hartman WE2V, (516) 462–5549* or *Mark Nadel NK2T, 516–796–2366.*

PARAMUS NJ The Bergen ARA will sponsor a Hamfest at Bergen Community College from 8 AM–2 PM. Unlimited free close-by parking. VE Exams. Sellers $5 per slot, unlimited space available. Buyers admitted free. Talk-in on W2AKR 146.790. Contact *Jim Joyce K2ZO, 286 Ridgewood Blvd. North, Westwood NJ 07675. 201–664–6725.* For VE testing contact *Pete Adely K2MHP, 13-30 Edward St., Fair Lawn NJ 07410. 201–796–6622.*

PEOTONE IL The annual Hamfest sponsored by the Kankakee Area Radio Society will be held at the Will County Fairgrounds from 8 AM–2 PM. Indoor exhibits, outdoor flea market. Free parking. Set-up 6 AM–8 AM. Overnight RV parking, no hookups. Admission $2.50 advance, $3 at the door. Talk-in on 146.34/.94. Contact *KARS c/o Frank DalCanton KA9PWW, R.R. #1 Box 361, Chebanse IL 60922. 815–937–2452 before 4 PM CST or 815–932-6703 after 4 PM CST.*

WRIGHTSTOWN PA The Warminster ARC will sponsor its 16th annual Hamfest at the Middletown Grange Fair Grounds beginning at 7 AM. Set-up at 6 AM. Admission is $4 per person (XYLs and children free). Free parking. Talk-in on 147.69/.09 repeater, 223.76/222.16 repeater, 52.04/53.04 repeater or 146.52 simplex. For pre-registration and info contact *Bill Cusick W3GJC, 215–441–8048.*

MAY 26

DURHAM NC The Durham FM Association will hold its 16th annual "DUR-HAM-FEST" under the South parking deck of the South Square Mall shopping center. Handicap accessible. Limited AC power available for dealer requirements and equipment testing. Advance tickets are $4, $5 at the door. Talk-in on the *WA4WTX/ 147.825/225* repeater. For tickets, send SASE and payment to *R.P. Buehlmann N4IQA, 1314 Chaney Rd., Raleigh NC 27606. Tables $6. Inquiries, reservations, may be directed to* E.R. Lappi WD4LOO, 203 Lynn Dr., Carrboro NC 27510, days at 919–541–7688, evenings before 9:15 PM at 919–942–4076. For general info contact *Sid Edwards W4QWM, 1700 High St., Durham NC 27712.* For FCC Exam info, contact *Pete Goolsby KY4Y, 120 Radcliff Circle, Durham NC 27713.*

MAY 27

CHICAGO IL Chicago ARC will hold its annual Hamfest and Auction at De Vry Institute of Technology. Free parking. For details and reservations call *312–545–3622.*

WEST FRIENDSHIP MD The Maryland FM Association, Inc. will hold its annual Memorial Day Hamfest at the Howard County Fairgrounds from 8 AM–3 PM. Talk-in on WA3DZD/Repeater (146.16/146.76, 223.16/224.76 and 449.0/444.0). Premises MUST be cleared by 5 PM. Donation $4. Tailgating $3. Inside table rentals, advance $10, $15 at the gate (if available). Only PAID table reservations accepted. Make checks payable to MFMA, Inc. For reservations contact *Melvin Seyle WA3KZR, 15809 Pointer Ridge Dr., Bowie MD 20716. 301–249–6147.* Commercial vendors must have proper tax/license certificates available.

QUEBEC The Quebec Provincial Hamfest will be held at the Tracy Curling Club. Admission $5. Outdoor table $8, indoor table $10. Limited quantity, please reserve before May 15th. Open at 0900 (0700 exhibitors). Contact *Sorel-Tracy ARC, PO Box 533, Sorel Q.C. J3P 5N6 Canada.*

SPECIAL EVENT STATIONS

MAY 5

USS OLYMPIA The Olympia RAC will operate WA3BAT on board Admiral Dewey's flagship the *USS Olympia* from 1400Z–2000Z, to commemorate the 92nd anniversity of Adm. Deweys' triumph over the Spanish Fleet at the Battle of Manila Bay during the Spanish-American War. Frequencies: (±5 kHz QRM) CW: 7133, 21133 and 28133. Phone: 3865, 7245, 14255, 21355, 28355 and 145.27 MHz FM. RTTY on 20 and 10 meters. For certificate, send QSL and 9x12 SASE with 3 units of postage/IRCs to *Olympia RAC, PO Box 928, Philadelphia PA 19105.*

MAY 5–6

MUSKEGO WI The W/K ARC will operate station AE9K from the Nichols Astronomical Observatory, from 1400Z Saturday–0500Z Sunday to commemorate National Astronomy Day. Frequencies: 14.250, 21.350, and 28.450 MHz. Also look for AE9K on RS10 in the CW mode. For special QSL send an SASE to *Nichols Observatory, 3885 Pioneer Rd., Richfield WI 53076.* SWL reports are welcome and qualify for the special QSL.

COLUMBIA SC The Columbia ARC will operate N4QWL from 1500Z Saturday–2100Z Sunday, from the South Carolina State Capital Grounds in conjunction with the Annual Mayfest Celebration. Frequencies: SSB 28.400, 21.400, 14.250, 7.200 MHz and CW 28.200, 21.040, 14.040, 7.040 MHz. QSL with SASE to *CARC Mayfest, PO Box 5802; Columbia SC 29250.*

TOWSON MD N3HFS will operate from 1500Z–2300Z Saturday, and from 1800Z–2300Z Sunday, to celebrate the 23rd annual Towsontown Spring Festival. Rain dates are May 12–13. Frequencies: 14.255, 21.355, 28.355, and 146.58 MHz phone, 10 and 15 meter Novice CW bands, 15 and 20 meter RTTY, and 145.030 packet. For QSL, send your QSL and SASE to *305 Colonial Court, Towson MD 21204.*

MAY 6

NEVADA The Nevada QSO Party, sponsored by the Frontier ARS, will be held 0000Z Saturday–0600Z Sunday. Work stations once per band per mode. Exchange RST and state/province/country. (County for Nevada stations.) Frequencies: 6 meters–160 meters. Modes: CW, SSB, RTTY, SSTV and packet. Scoring: 1 pt. phone QSO; 2 pts. QSO other modes. Multiply by number of states/provinces/countries (Nevada multiply by counties). Certificates awarded to top score each state/province/DXCC country. General and above/Novice/Tech. mail entry by June 1, 1990 to *Jim Frye NW7O, 4120 Oakhill Ave., Las Vegas NV 89121.*

MAY 10

PROMONTORY UT The Ogden ARC will operate WJ7H from Promontory Summit to commemorate the 121st year of the driving of the Golden Spike. Operation time from 0001Z–2100Z. Frenquencies: 3.970, 7.270, 14.280, 21.375, 28.415. Send QSL and SASE to *Ogden ARC, PO Box 3353, Ogden UT 84409.*

MAY 11–13

ESCONDIDO CA In conjunction with the Annual Avocado Festival, the Escondido ARS will operate special event station WA6YOO on the festival grounds from 0000Z May 11–2400Z May 13. SSB operation at 3950, 7250, 21350 and 28450 kHz. CW operation will be 50 kHz up from the band edges. For an unfolded commemerative certificate, send QSL and large SASE (2 units of postage) to *E.A.R.S., 2435 Our Country Road, Escondido CA 92025.*

MAY 19

WASHINGTON DC The Pentagon ARC will operate K4AF in celebration of Armed Forces Day. Frequencies: Phone–7.235, 14.235; CW–7.035, 14.035. For QSL, send QSL and SASE to *PARC, PO Box 47063, Washington DC 20050.* Please include $1 if you want an 8x10 certificate.

PASADENA MD The Bay Area ARS will operate Station KM3I to commemorate the 146th anniversary of the telegraph message "What Hath God Wrought?", transmitted on an experimental line from Washington DC to Baltimore MD. CW frequencies (MHz): 7.110, 14.035, 21.110, 28.110. For commemorative certificate send your QSL card (SWL listeners send details of a QSO) along with a large (8½ x 11) SASE to *The Bay Area Amateur Radio Society, PO Box 805, Pasadena MD 21122-0805.*

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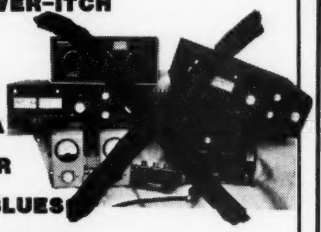

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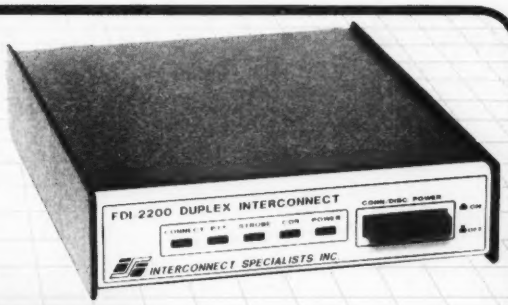

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HAM HELP

Your Bulletin Board

We are happy to provide Ham Help listings free on a space available basis. To make our job easier and to ensure that your listing is correct, please type or print your request clearly, double spaced, on a full (8½" x 11") sheet of paper. You may also upload a listing as E-mail to Sysop to the 73 BBS. (1200 baud, 8 data bits, no parity, 1 stop bit. (603) 525-4438). Use upper- and lower-case letters where appropriate. Also, print numbers carefully—a 1, for example, can be misread as the letters l or i, or even the number 7. Thank you for your cooperation.

I need programming information on a Pace Landmaster II UHF mobile. If anyone has a service manual, please call me at (213) 926-2227 or leave a note for me. I will pay for postage, phone call, etc. Thank you. *Greg Fox N6QKR, PO Box 5824, Fullerton CA 92635.*

I would like to make contact with anyone that uses a Zenith Z170 computer for ham use. *Msg. Skip Barley, HHC, 26th Signal Bn., Box 561, APO NY 09176.*

Need info on substituting tubes for original 7094s in Hallicrafters HT 41. *S. Kiraly WA2O, 51 Ramon Blvd., Freehold NJ 07728. (201) 462-2705.*

I need the owners manual and schematics for the Allied AX-190. I will pay copying and shipping costs. Also want info on any ham software or ideas for new stuff for the Macintosh. Thank you. *Kevin der Kinderen KJ4QF, USAFS Sinop, PO Box 372, APO NY 09133.*

Wanted: Schematic diagram with or without manual for the Knight sine/square wave Generator Model KG-688. Will pay costs. *Harry Greulich WA6IWZ, 442 S. Alpine Rd., Orange CA 92668.*

Needed: Manual & schematic for Hewlett-Packard Model 608E Signal Generator. Will pay postage & copying costs. *Mike Colburn, 1422 Everview Rd., San Diego CA 92110-1527.*

Wanted: Ur fix for rapid aging of Kenwood TS-6805 transceivers. *Lin Hamilton NJ6Y, 1150 Capitol Drive #84, San Pedro CA 90732.*

Wanted: Manuals for Kenwood TR-7600 and A76 memory/scan add-on. Bought used, but no manuals available, and some options are not easily deduced. *John Clark, 1807 Fornfelt St., Scott City MO 63780. (314) 264-2791.*

I am looking for help finding a manual and schematic for the Ham Keyer, Model HK5A. I am willing to pay a reasonable price and shipping costs. *Hank Gillis, 1212 Laurel Ave., St. Paul MN 55104.*

Need a schematic for the Regency Model BTL-301 high band VHF commercial transceiver. Will pay costs. Thanks. *Bill Graham N5LMX, 9704 164th Street East, Puyallup WA 98373.*

Need a copy of the schematic (only) for a Heathkit SG8 Signal Generator. All replies acknowledged. Thanks! *Greg Magarie WA1VIL, 33 Barnesdale Rd., Natick MA 01760.*

If anyone has info regarding UHF band modifications for the FT-470 HT for the 470 MHz band, please leave E-Mail on the *73* BBS for *Efrain.*

I would like to hear from any ham who has a DJ2UT-Multiband Beam by Sommer. I am having VSWR problems on the 17 and 30 Meter bands. Thank you. *Dale McMindes EL2DC/KA4HBW, American Embassy-VOA, APO New York 09155.*

Does anyone have a manual for the Tempo One HF transceiver? I will pay copying charges. *Geoffrey Deasey, 19 Maple Ave., PO Box 476, Madison NJ 07940. (201) 379-7400.*

NEEDED: Papers and technical programs for presentation at the Central States VHF Society conference in July. Contact *Jon Jones NO0Y, 1116 Gatewood Ct., Wichita KS 67206 or John Lock KF0M, 1427 S. St. Clair, Wichita KS 67213.*

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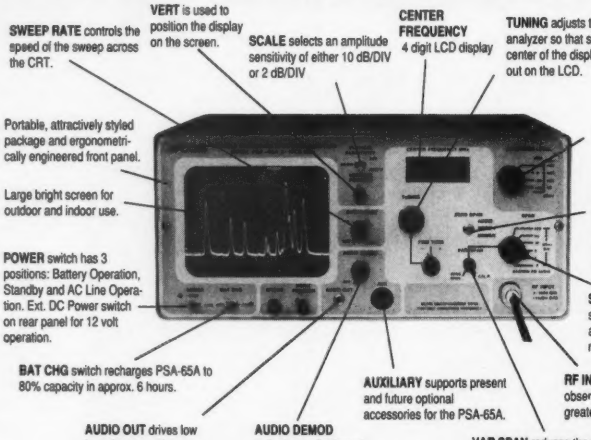
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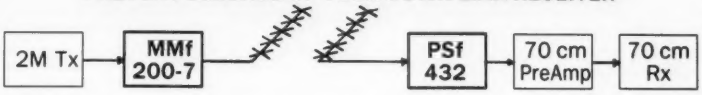

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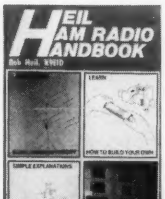

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Change of Scene

Every now and then I like to set up and operate my HW-8 from the back yard. I know it's not exactly a DX site, but it does change the surroundings a bit.

So here I go. I carry up the HW-8, battery, solar panel, log book, SWR meter, keyer and keyer paddles. My goodness, that's a lot of junk! What in the world would I do if I needed to do this in a hurry? The idea would be to eliminate some of the odds and ends.

To shave off some of the extras, I could use my Argonaut and keep the SWR meter in the shack. The Argonaut has an SWR meter built in.

Of course, we need a power supply. An 8-amp gel/cell works just fine. No worry about acid spills with the sealed battery.

A Solarex MSX-10 will supply 10 watts of solar power to keep the battery charged, or it can run the radio directly if need be.

Got to keep the log book. Just in case.

Sure need the keyer. Can't see myself running CW during a disaster with a Navy J-48 straight key! And of course, a set of paddles. Now, here is trouble. How or what does one do for paddles? I guess you could say you're up the creek without a paddle.

Mobile CW

If you've ever worked CW mobile before, I'm sure you've worried about this one. There is no single correct answer. I have worked on the problem and come up with these ideas. Ideally, the keyer and the paddles should be housed within the same box. This way you only have to carry one box instead of two. Of course, the unit should be able to stand up to the rigors of mobile/portable use.

I've seen several designs using micro-switches. These seem to work, but you can't adjust a micro-switch. It is either on or off. In other words, there is no feel to the paddle.

My first attempt at fixing the problem was to use a commercial product. My victim turned out to be an old Ten-Tec K-5 single paddle keyer, which I picked up at a hamfest.

There was a lot of wear and tear on this unit. In fact, when I powered it up, the poor thing would start sending CQ DX! Looking over the keyer revealed a very badly worn paddle assembly. A quick call to Ten-Tec had two new paddle assemblies on their way. One for the repair, the other for stock.

While I was waiting for the parts to arrive, I tried using the K-5. Try as I might, I was less than impressed with the results. Most of the keyers I use at my shack have dot/dash memory. In other words, you make a dash and then a dot, and while the keyer is generating the dash, it will remember you want a dot next. After the dash is complete, the keyer will send the dot. The K-5 will not do this. I kept sending CW with a missing dot or two, or three or four.

I fixed the problem by first tearing the circuit board out of the K-5. Easy fix. In its place I installed a small CMOS keyer from an old *QST* article. Although the circuit uses several CMOS chips, the results are very good. Self-completing dots and dashes, and dot-and-dash memory. I modified the circuit for 12-volt operation and added a small reed relay for transmitter keying.

If you wanted to, you could use a Curtis keyer on a chip. I didn't have one handy. I just used what was lying on my workbench.

While I had the case torn apart, I added a three-circuit jack on the back panel. This will allow me to add an external paddle set if I want to.

When the circuit board was stuffed, I installed the new paddle assembly part along with the keyer board. The results were much better. Even though the keyer circuit I used is capable of iambic keying, the use of a single paddle rules this feature out.

Now the re-fitted K-5 is much more to my liking. I can pack it along with the rest of the gear. Even if the paddles are not state-of-the-art, they do work quite well.

I was still not a happy camper. Not yet. I was planning to use the portable keyer with a home-brew rig. So what's the big deal? The K-5 was bigger than the rig! I needed a small hand-held keyer—with a built-in paddle.

Cutting it Down to Size

After many hours of tinkering, I have to say this keyer is less than perfect. In fact, the key paddle is worse than the worn out assembly part from the K-5! However, the result is a small, hand-held unit that works just fine.

The following is not a step-by-step list of instructions. The user will have to build his/her own version. Most of the parts came from my junk box and the local hobby store. The paddles are guitar picks.

I had no idea just how many different types of guitar picks are made. And when I went to the music store, how was I going to explain what I was going to use them for? So I told the guy behind the desk I used to play back-up guitar for Jimi Hendrix, and I was going to get back into the music scene. He laughed so hard he gave me my choice of picks for ten cents each!

Having the paddles, all I needed now was a set of contacts and a moving bar to make and break on those contacts. Here is what I came up with.

Making the Contacts

First I cut a small block of plastic down the middle, about three-quarters of the way though. Then I went to the hobby store for some brass strips 4" x ⅛". Determine thickness of the strips according to how much give you want. Also, the longer the strip, the more spring it will have.

About an inch is held in the plastic block, two 6-32 screws keeping the block and brass strip together. For the ground connection, I added a solder lug. The brass strip is the moving ground for the keyer. The block is supported ¼" above the bottom of the chassis.

The hardest part was coming up with the contacts. What I did was take a set of bakelite contacts from an old relay. One set of contacts were cut from the main body of the relay and glued to a piece of plastic channel using epoxy. By leaving the solder taps on, I had an easy place to solder the dot and dash wires from the keyer.

Setting the contacts was fairly routine. Using small needle-nosed pliers, I bent the contacts to suit myself. Since the brass strip can move the contacts if pushed too hard in either way, the paddle travel is determined by the front panel. The hole in the brass strips, though, is the stop. By making the hole larger, you'll increase paddle travel. It's really a cut-and-try method of building!

After you're happy with what you've made so far, all you have to do is glue the guitar picks onto the brass strip. I use super glue and it seems to work, if you pardon the pun, just super!

The electronics used for the keyer are a bit strange. After all the belly-aching about the K-5 and its circuit, I ended up using something very much like it.

In fact, I use the DYI keyer from the July 1988 QRP column in *73 Magzine*. As I said in the original article, all this thing does is make dots and dashes. Nothing more.

Some good news. Thanks again for people like Tom Berryhill AB0Q, who supplied the printed circuit boards for the DYI keyer. There are few hams in Tom's class. I'm truly proud to know him.

Since the DYI keyer can operate from a wide range of voltages, I didn't want to mess with a 9-volt battery inside the keyer. I get operating power from the host radio via a three-wire cable. This cable also supplies the host with the keyer's output. So with three wires I get the following: ground, +12 for keyer, and keyer output for radio. This cable is hard-wired to the keyer. A three-terminal, ¼" plug terminates the other end.

A strip of double-sided tape holds the circuit board in the case. Nothing fancy, but it works.

I just could not hold back when I was putting all this together. I added a simple tune button from Ten-Tec on the top of the keyer. Ten-Tec uses the very same thing on their keyers. A set of small stick-on feet finishes off the keyer.

Kits Available

So how does it work? Well, not too bad. Nothing to really get excited about, but it sure beats using micro-switches for a paddle. The whole thing is about the size of a pack of cigarettes. Why, who knows? This might be my gateway to 50 wpm, portable.

If you're interested in building a DYI keyer, I have had some more kits made up, $12 postpaid. These kits have just about everything you need to build the basic keyer. You'll have to supply the metal parts. Hurry, since I don't have too many of them.

One last thing before we go. June is Field Day. How about some good photographs of your Field Day? Let the other guys shake in their boots when they see your set-up. 73

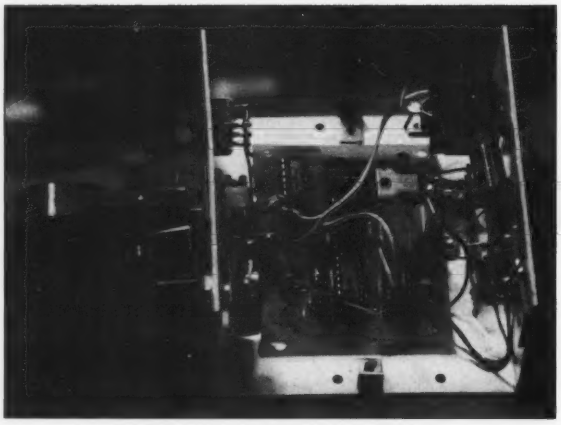

Photo A. The modified Ten-Tec K-5 keyer.

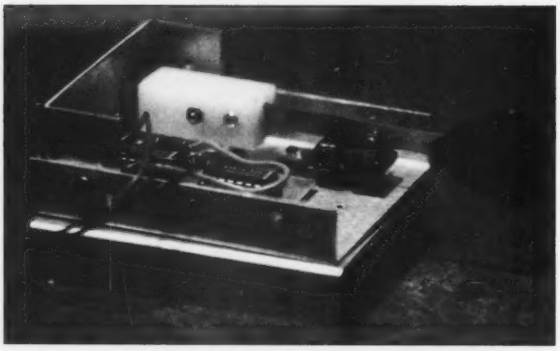

Photo B. Home-brew hand-held mobile keyer. The paddle is a guitar pick.

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The *Bearcat* 760XLT has 100 programmable channels organized as five channel banks for easy use, and 12 bands of coverage including the 800 MHz. band. The *Bearcat* 760XLT mounts neatly under the dash and connects directly to fuse block or battery. The unit also has an AC adaptor, flip down stand and telescopic antenna for desk top use. 6-5/16" W x 1⅝" H x 7⅝" D. Model **BC 590XLT-A** is a similar version without the 800 MHz. band for only $199.95. Order your scanner from CEI today.

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FP320S-A *Uniden* feature speakerphone.....$49.95
FP322S-A *Uniden* feature speakerphone.....$59.95
XE570-A *Uniden* cordless phone.....$74.95
XE422S-A *Uniden* cordless speakerphone.....$109.95
XE777S-A *Uniden* cordless speakerphone.....$109.95
BT100-A *Uniden* Trimstyle phone.....$17.95
KT280-A *Uniden* Family phone with 911 feature...$29.95
FF150-A *Uniden* Executive phone.....$39.95

RELM® RH256B-A

List price $587.50/**CE price $299.95/SPECIAL**
16 Channel • 25 Watt Transceiver • Priority
The *RELM* RH256B is a sixteen-channel VHF land mobile transceiver designed to cover any frequency between 150 to 162 MHz. Since this radio is synthesized, no expensive crystals are needed to store up to 16 frequencies without battery backup. All radios come with CTCSS tone and scanning capabilities. A monitor and night/day switch is also standard. This transceiver even has a priority function. The RH256 makes an ideal radio for any police or fire department volunteer because of its low cost and high performance. A *60 Watt* VHF 150-162 MHz. version called the **RH606B-A** is available for $429.95. A UHF 15 watt, 16 channel version of this radio called the **RU156B-A** is also available and covers 450-482 MHz. but the cost is $454.95.

★★★ Uniden CB Radios ★★★

The *Uniden* line of Citizens Band Radio transceivers is styled to compliment other mobile audio equipment. Uniden CB radios are so reliable that they have a two year limited warranty. From the feature packed PRO 810E to the 310E handheld, there is no better Citizens Band radio on the market today.

PRO310E-A *Uniden* 40 Ch. Portable/Mobile CB...$83.95
PRO330E-A *Uniden* 40 Ch. Remote mount CB...$104.95
PRO500D-A *Uniden* 40 Channel CB Mobile.....$38.95
GRANT-A *Uniden* 40 channel SSB CB mobile....$166.95
PC122-A *Uniden* 40 channel SSB CB mobile.....$119.95
PRO510XL-A *Uniden* 40 channel CB Mobile.....$38.95
PRO520XL-A *Uniden* 40 channel CB Mobile.....$56.95
PRO530E-A *Uniden* 40 channel CB Mobile.....$79.95
PRO640E-A *Uniden* 40 channel SSB CB Mobile...$137.95
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CARD-A Uniden credit card size radar detector $179.95

Bearcat® 200XLT-A

List price $509.95/**CE price $239.95/SPECIAL**
12-Band, 200 Channel • 800 MHz. Handheld Search • Limit • Hold • Priority • Lockout
Frequency range: 29-54, 118-174, 406-512, 806-956 MHz. Excludes 823.9875-849.0125 and 868.9875-894.0125 MHz.
The *Bearcat* 200XLT sets a new standard for handheld scanners in performance and dependability. This full featured unit has 200 programmable channels with 10 scanning banks and 12 band coverage. If you want a very similar model without the 800 MHz. band and 100 channels, order the **BC 100XLT-A** for only $189.95. Includes antenna, carrying case with belt loop, ni-cad battery pack, AC adapter and earphone. Order your scanner now.

Bearcat® 800XLT-A

List price $549.95/**CE price $239.95/SPECIAL**
12-Band, 40 Channel • No-crystal scanner Priority control • Search/Scan • AC/DC
Bands: 29-54, 118-174, 406-512, 806-912 MHz. Excludes 823.9875-849.0125 and 868.9875-894.0125 MHz.
The Uniden 800XLT receives 40 channels in two banks. Scans 15 channels per second. Size 9¼" x 4½" x 12½." If you do not need the 800 MHz. band, a similar model called the **BC 210XLT-A** is available for $178.95.

Bearcat® 145XL-A

List price $189.95/**CE price $94.95/SPECIAL**
10-Band, 16 Channel • No-crystal scanner Priority control • Weather search • AC/DC
Bands: 29-54, 136-174, 406-512 MHz.
The *Bearcat* 145XL is a 16 channel, programmable scanner covering ten frequency bands. The unit features a built-in delay function that adds a three second delay on all channels to prevent missed transmissions. A mobile version called the **BC560XLT-A** featuring priority, weather search, channel lockout and more is available for $94.95. CEI's package price includes mobile mounting bracket and mobile power cord.

President® HR2510-A

List price $499.95/**CE price $239.95/SPECIAL**
10 Meter Mobile Transceiver • Digital VFO Full Band Coverage • All-Mode Operation Backlit liquid crystal display • Auto Squelch RIT • Preprogrammed 10 KHz. Channels
Frequency Coverage: 28.0000 MHz. to 29.6999 MHz.
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NEW! President® HR2600-A

List price $599.95/**CE price $299.95/SPECIAL**
10 Meter Mobile Transceiver • New Features
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BC760XLT
800 MHz. mobile scanner
SPECIAL!

★★★ Extended Service Contract ★★★

If you purchase a scanner, CB, radar detector or cordless phone from any store in the U.S. or Canada within the last 30 days, you can get up to four years of extended service contract from Warrantech. This service extension plan begins *after* the manufacturer's warranty expires. Warrantech will perform all necessary labor and will not charge for return shipping. Extended service contracts are not refundable and apply only to the original purchaser. Warrantech does *not* have an extended warranty plan for *handheld* scanners. For mobile or base scanners, CB radios or radar detectors a 1 year extended warranty is $19.99, two years is $39.99 and four years is $59.99. Order your service contract today.

OTHER RADIOS AND ACCESSORIES

BC55XLT-A *Bearcat* 10 channel scanner $114.95
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PS001-A Cigarette lighter cable for BC55XLT.....$14.95
VC001-A Carrying case for BC55XLT.....$14.95
AT054-A Replacement antenna for BC55XLT.....$14.95
BC70XLT-A *Bearcat* 20 channel scanner.....$159.95
BC175XLT-A1 *Bearcat* 16 channel scanner.....$134.95
BC1-A *Bearcat* Information scanner with CB.....$129.95
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UC102-A *Regency* VHF 2 ch. 1 Watt transceiver...$114.95
VM200XL-A *Uniden* Video monitoring system.....$179.95
BP205-A Ni-Cad batt. pack for BC200/BC100XLT...$39.95
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USAK-A ¾" hole mount VHF ant. w/ 17' cable.....$34.95
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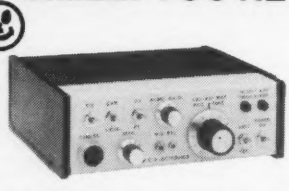

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Never Say Die

Continued from p. 4

music goes. I love music and want to do what I can to get you to share the things I enjoy. So check it out. Music/NH is a way for you to find those hard-to-find CDs produced by independent record entrepreneurs.

At this writing Scott Kirby is again visiting at my farm, laying down tracks for a second Scott Joplin CD. Knud Keller KV4GG is here almost daily, attending to the two 1890s pianos Scott is using. And I'm in almost constant bliss, listening to Joplin's incredible music night and day . . . played by the best ragtime pianist I've ever heard.

If you can get to New Orleans, watch for Scott and his piano playing ragtime on the street. Tip him generously . . . it's his main source of livelihood. If you get to Mobile, don't miss my old home during WWII, the Drum SS228.

Why You Should Travel

Can I get you out of your rut? Is it possible for me to change your life . . . for the better? I'm going to give it a try.

A letter from W4UW reminded me that many years ago I wrote an editorial pointing out that travel really isn't very expensive . . . and that the money you spend on travel will bring you more value in your life than any other comparable investment.

For most of us it isn't the expense of travel that stops us . . . because it really doesn't have to cost all that much. You don't think much these days of buying a new TV set or VCR.

Sherry and I just returned from a fantastic trip to Europe. The flight cost only $300 round trip. Sure, you have to watch for travel bargains like that, but if I can find 'em, so can you. During the eight days our hotels averaged about $90 a night . . . which included excellent buffet breakfasts. We packed away enough at breakfast so we seldom needed more than one other meal a day . . . and those were often under $10 for the two of us. Sometimes way under.

I used to talk a dozen or so hams into going with me to Asia every October to see the electronic shows in Japan, Korea, Taiwan and Hong Kong. The trip, including first class hotels, all travel, huge breakfasts and banquet dinners in each city, cost about $1,500 for two weeks. No one who went on those trips will ever forget any part of them.

No, it isn't the cost which is keeping you from seeing the world . . . keeping you from visiting Swaziland or Lesotho and getting on the air for some unforgettable DXing . . . it's more you're inability to actually make up your mind to do things. I DO things.

I have priceless memories of DXing from Navassa, Kuching, Kota Kinabalu, Aden, Damascus and Katmandu. I wouldn't trade those memories for anything.

So where have you been going on vacation? Florida? Disney World? It wouldn't cost you much more to visit Budapest and meet the friendly hams there. Or Stockholm. Or Mariehamn, up in the Aland Islands (OHØ).

For just a few hundred dollars extra, Sherry and I extended one Asian electronics tour to include Bangkok, Singapore, Brunei, Sabah, Sarawak and the Philippines. The hams in these countries helped make our visits to these strange places unforgettable.

No, it isn't the money that stops most people from going on DXpeditions or even just plain traveling. It isn't the time away from work. It's inertia.

Heck, if you work any DX at all you're up to here in offers to visit when you're in the area. Twenty years ago there was a Ham Hop Club which helped arrange ham visits in dozens of countries. If anyone is interested in getting something like this going again, I'll be glad to help. No, I'm not (for once) going to do it myself. I'd rather spend the time it would take to organize and run a ham travel club going on a few more DXpeditionettes.

Eastern Europe is in a turmoil and one of the benefits to us is that for the first time in years the hams in these countries can safely talk on the air with us. We can visit these countries for peanuts and get to know their hams. It's no longer difficult to get a license and sit down for a few days of DXing using a borrowed station.

It's much easier to use a station that's already there than to cart one halfway around the world. You see, 99% of the hams in rare countries are delighted if you'll work the pileups for a few days for them . . . and take care of those confounded QSLs. It just isn't any fun for someone in Sarawak to be constantly faced with thousands of DX-CC fanatics who refuse to permit them anything more than a signal report and want nothing more than a QSL card. Working endless hundreds of DXers who obviously could care less about you as a person isn't much fun. That gets old quickly. The DXCC award pressure helps keep these countries rare and discourages new hams.

So I've had great fun operating from fairly rare spots such as Jordan, New Caledonia, Western Samoa, Fiji, Wake Island, Bangkok, Katmandu, Damascus, Kenya, Aden, Afghanistan, Iran, Tahiti, Haiti, Bermuda, Aland, Lebanon, Lesotho, Swaziland . . . and many others. And all this while you were sitting there watching ballgames and *Dallas* on TV.

Oh, I've watched ballgames on TV too, but they weren't as memorable as my trips. I seem to remember watching the World Series once . . . the Brooklyn Dodgers vs. the Giants, I think it was . . . or maybe the Yankees. It was a while ago . . . and the last baseball I've watched. I guess I prefer doing things to being a couch potato and watching others. Zooming down the slopes beats the heck out of watching skiers on TV. No video of scuba diving even comes close to the excitement of the real thing.

You'll find the hams around the world eager to meet you and talk. If you start spending your vacations visiting rare countries and activating 'em, you'll have articles to write for *73*, pictures to show your club and at ham-

Continued on p. 73

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Typical rejection:
±600Khz @ 145 Mhz: 28db
±1.6 Mhz @ 220 Mhz: 40db (44db GaAs) ±20 Mhz @ 800 Mhz: 65db
± 5 Mhz @ 450 Mhz: 50db (60db GaAs) ±20 Mhz @ 950 Mhz: 70db

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NEW Model ID-2B

The ID-2B provides required station identification without troublesome diode programming. The "ID over voice inhibit" circuitry allows for courteous operation by not allowing an ID until the next squelch closing.

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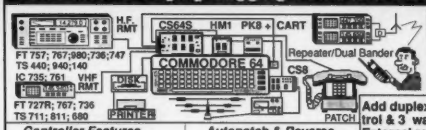

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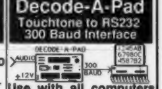

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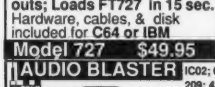

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Number 22 on your Feedback card

R.S.#		page
355	Ace Communications	79
1	Advanced Computer Control	63
65	Advanced Electronic Applications	13*
126	Aero Data Systems	58
88	Aerospace Consulting	62
67	Alinco Electronics	15*
194	All Electronics Corporation	67
•	Amateur Electronics Supply	25*
45	Amateur TV Quarterly	54
4	Amidon Associates	51
37	Ampire, Inc.	83
35	Amsat	44
89	Antennas West	58
107	Antennas West	57
302	Antennas West	41
304	Antennas West	79
90	Antennas West	62
5	Antennas West	83
236	Antennas West	55
303	Antennas West	83
271	Antique Radio Classified	83
338	Ashton ITC	59
•	Assocation of Shareware Professionals	44
•	Associated Radio	57
16	Astron Corporation	30
50	Atlanta Ham Festival	43
27	Avcom of VA.	66
243	AXM, Inc.	61
•	Azimuth Communications	55
21	B & B, Inc.	61
53	Barker & Williamson	23
41	Barry Electronics Corporation	27
42	Bilal Company	57
365	Buckmaster Publishing	79*
170	Buckmaster Publishing	57*
7	Buckmaster Publishing	41*
•	Butternut Electronics	43
•	CB City International	55
356	C & S Sales, Inc.	61
343	Commpute Corporation	51
99	Communication Concepts, Inc.	51
121	Communications Electronic	69
10	Communications Specialist	33*
40	Computer Automation Technology, Inc.	59
15	Comtelco	83
•	Control Products	16
306	Creative Control Products	83
29	Custom Embroidery	81
39	D & Z Engineering	44
•	Dallas Ham Com	65*
147	Data Com International	41
•	Den - Tronics	81
•	Down East Microwave	44
114	E. H. Yost	40
291	Electron Processing	83*
386	Electronic Engineering	83
8	Elktronics	55
•	Engineering Consulting	71
75	Fair Radio Sales	81
26	First Call Communcication	79
18	Fox Tango Corporation	81
373	Gap Antenna Products	16
392	GGTE	81*
17	GLB Electronics	71
72	Glen Martin Engineering	41
390	Grapevine Group	52
346	Great Circle Maps	59
58	The Gus Brownings	61
19	Hall Electronics	63
•	The Ham Center	81
•	Ham Radio Classifieds	62
57	Hamtronics, Inc.	42
•	Heath Comapny	36,37
269	Hustler, Inc.	51
•	ICOM America	CV2*
•	Intercon Data Systems	52
100	Interconnect Specialist	65
•	International Radio	37
42	Isotron	57
272	Jun's Electronics	43
92	K-40	41
•	Kenwood U.S.A. Corporation	5,6,CIV*
23	Larsen Antenna	8
25	Madison Electronic Supply	59
•	Maggiore Electronics Lab.	71
101	Maxcom, Inc.	65*
241	Media Mentors	62,79*
•	Melco Publishing	67
44	Metro Printing	63
86	MFJ Enterprises	1
348	Micro Computer Concepts	39
295	Micro Control Specialities	57
43	Music N.H.	48,49,50
349	Naval Electronics	70
•	NRI School	21
•	Oklahoma Comm Center	40
•	P.C. Electronics	54,70*
152	Pac-Comm	41
178	Pacific Cable Company, Inc.	81
68	Periphex	55
•	Procomm / Digitrex	51
145	QSO Software	23
24	Quorum Communications	66
31	Radio Amateur Callbook	28
150	The Radio Works	83
48	Radiokit	40,61
34	Ramsey Electronics	22*
14	Renaissance Development	62
115	RF Connection	83
171	RF Enterprises	34
254	Ross Distributing	79
332	Satellite City	60*
382	SCO Electronics	63, 81
250	Software Systems	61, 62
244	Software Systems	81
23	Somerset Electronics	52
•	Sony Corporation of America	40
51	Spectrum Communications	29
183	Spectrum International	67
11	Surplus Sales Of Nebraska	52
87	TCE Labs	52
49	Traxit, Inc.	55
•	Universal Amateur Radio	83*
382	U.S. Cable T.V. Inc.	81
•	Uncle Wayne's Bookshelf	86,87
79	Vanguard Labs	81
•	VHF Communications	62
191	W & W Associates	37
353	William M. Nye Company	79
20	Wolfe Communications	67
38	W9INN Antennas	62
•	Yaesu Electronics Corporation	CIII

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•These advertisers prefer to be contacted directly.

Number 23 on your Feedback card

KEYWORD INDEX

ISSUE #356

ACDXA 7
Amateur Auxiliary 80
AMSAT address 54
antenna, HF Homer 80
antenna, tree 26
antenna, WARC bands 32
"Atlas" Radio 7
Australia 82
balloon ATV 54
Brazil 82
Circuit Specialists 80
Communicator Class 7
computer/ATV op 53
Cushcraft D3W 32
CW mobile keyer 68
Digi-Key part no. 76
DOVE 46
DX books, newsletters 60
FAX controller circuit 24
G3ZCZ, Joe Kasser 58
Great Circle Map Company 58
Heath/Tasco HK-21 9
ICOM America survey 3, 47
IPARN network 7
Israel 82
Italy 82
Japan 7, 24, 82
JAS-1b 7
KØOV, Joe Moel 80
K4RQQ station 47
KA1UKM, Linda Reneau 18
KB1UM, Michael Geier 76
KB2IGG, Mary Alestra 20
KB5AWP, Ken Cameron 12, 17
KC6HJJ, David Piotrowski 17
LAN-LINK 58
Latvia 82
Liberia 84
Lithuania 84
microwave modules 77-78
modem 9600 bps, circuit 26
N1BAC, Arnie Johnson 82
N4RVE, Steve Roberts 19
packet chess 58
packet SAREX 11-12
power generation 76
Project OSCAR address 14
propagation 88
Redwood Youth Foundation 19
RF Parts 78
Rumania 82
SAREX, acronym for 9, 39
SAREX freqs 10-12
satellite freqs and op 46-47
satellite tracking software 14
"sniffer" circuit 80
STS-35 9-12
STS-37 10
Surplus Sales of Nebraska 80
Switzerland 82
transverter protection 77
WØORE, Tony England 9, 38, 39
W1XU, Jim Gray 88
W2JIO, Robert W. Gunderson 7
W3IWI, Tom Clark 9
W3XO, Bill Tynan 9
W5KNE, Bob Winn 60
W5LFL, Owen Garriott 9, 38
WA1LBP, David Cowhig 24
WA4BLC, Bill Clarke 32
WA4SIR, Ron Parise 9, 17
WA5ZIB, Andy MacAllister 46
WA6ITF, Bill Pasternak 38
WA6KFA, Mary Duffield 18
WB2MGP, Carole Perry 20
WB6IGP, C.L. Houghton 77
WB6JNN/9, Jim Eagleson 14
WB8ELK, Bill Brown 53
WB8VGE, Mike Bryce 68
WEBERSAT 47, 53
WEBERWARE 1.0 54
West Siberia DX Club address 82

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11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53	54	55	56	57	58	59	60
61	62	63	64	65	66	67	68	69	70
71	72	73	74	75	76	77	78	79	80
81	82	83	84	85	86	87	88	89	90
91	92	93	94	95	96	97	98	99	100
101	102	103	104	105	106	107	108	109	110
111	112	113	114	115	116	117	118	119	120
121	122	123	124	125	126	127	128	129	130
131	132	133	134	135	136	137	138	139	140
141	142	143	144	145	146	147	148	149	150
151	152	153	154	155	156	157	158	159	160
161	162	163	164	165	166	167	168	169	170
171	172	173	174	175	176	177	178	179	180
181	182	183	184	185	186	187	188	189	190
191	192	193	194	195	196	197	198	199	200
201	202	203	204	205	206	207	208	209	210
211	212	213	214	215	216	217	218	219	220
221	222	223	224	225	226	227	228	229	230
231	232	233	234	235	236	237	238	239	240
241	242	243	244	245	246	247	248	249	250
251	252	253	254	255	256	257	258	259	260
261	262	263	264	265	266	267	268	269	270
271	272	273	274	275	276	277	278	279	280
281	282	283	284	285	286	287	288	289	290
291	292	293	294	295	296	297	298	299	300
301	302	303	304	305	306	307	308	309	310
311	312	313	314	315	316	317	318	319	320
321	322	323	324	325	326	327	328	329	330
331	332	333	334	335	336	337	338	339	340
341	342	343	344	345	346	347	348	349	350
351	352	353	354	355	356	357	358	359	360
361	362	363	364	365	366	367	368	369	370
371	372	373	374	375	376	377	378	379	380
381	382	383	384	385	386	387	388	389	390
391	392	393	394	395	396	397	398	399	400

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Continued from p. 70

fests, and you'll have a new bunch of friends to talk with on the air . . . friends you know personally.

TWA has an el cheapo flight to London over the Thanksgiving weekend. For around $600 each, Sherry and I went to London last November . . . and that included a Hilton hotel with big breakfasts, two shows and a car for the week.

You just have to keep your eyes open and grab the chances when they pop up. There was a bargain skiing trip to Italy in February, but I was busy with my visit to Poland and Czechoslovakia, so I missed it. Aspen in January? You bet . . . that's the low season, oddly enough. And when you get together with a group of friends, it's surprisingly inexpensive. The skiing costs, but it's half price for old timers like me.

One of the best travel bargains I've found is the Eastern/Continental Airlines Get Up And Go Passport . . . for people over 62. You can use it once a week and go first class for a whole year for about $2,000.

If you come across any outstanding travel bargains, for Pete's sake drop me a line or a FAX. I don't want to miss out, if there's any chance for us getting away.

Poland—Up Close

Yep, while other ham magazine editors are bringing you exciting hamfest food reviews, your dedicated *73* correspondent has been visiting Poland and Czechoslovakia . . . talking with the hams to get their perspective on the recent incredible political events. The events in these countries are most important to amateur radio . . . and as it turns out, we here in America can do a lot to help our Eastern European fraternity members cope with the changes.

It all started five months ago when Hope Currier, one of our *73* editors, got wind of a special Lufthansa bargain . . . $300 round trip anywhere in Germany. Hmmm, Germany? $300? Let's take a look at the little old map of Europe and see where we're going.

The action looked to me as if it would be in Poland and Czechoslovakia, so the best starting point would be Munich. Yep, we'd rent a car, drive down to Vienna and then up to Krakow, over to Prague and back to Munich. That ought to do it.

Andrew SP9RPT with a surplus rig.

Jan SP9LLH with a Polish HT.

I had too many other commitments to make the trip in October, November, December, January, March or April, so it had to be February. Yoiks, driving over a thousand miles in the dead of winter in the middle of Europe? I'd likely be up to my kazoo in snow. And the drive between some of those cities isn't easy either, even in good weather! Oh, well, I always seem to be able to blunder through somehow.

I asked Jim K6MH to get licenses for me for DL, OE, SP and OK . . . and to help set me up to meet the radio clubs. Despite the five month lead time, Jim was only able to get me a license in Germany!

Henryk SP9JPA with W2NSD/1.

To fit the trip in between my other travel commitments I had to limit it to ten days, maximum. That meant one day over, one day back, one day in each city and the best part of another day driving between the cities. In the snow, in all probablility.

Oddly enough, this trip was already scheduled when Sherry asked me to go to Munich with her on a weekend business trip in early November. That was when she wanted to get a video of people dancing the Lambada . . . the Brazilian dance which is sweeping America now.

It was tough taking time off from work to make this trip. I'd only been at home a week in January . . . just barely enough time to come up with four or five new business ventures and get them started. I keep thinking up more and more ways to help independent record companies sell music. I wish I had a dozen more entrepreneurially-inclined people working with me to speed up these new projects. It's frustrating to see so many things which should be done and to not be able to find enough enthusiastic people to tackle them. I've got my present team going crazy trying to keep up.

Now, The Trip. We started from Boston and flew to Frankfurt, leaving Sunday evening and arriving Monday morning. Then a short commuter flight to Munich. They have nice bag lunches for these flights which some American airlines would do well to check out. You grab a bag as you get on the flight. Sandwich, cake, candy,orange drink. Sure beats most hamfest food.

In Munich, Avis had an Audi 100 for us. We loaded our three suitcases and assorted hand luggage into it. Sherry takes her refrigerator-sized portable Mac everywhere with her. I always have at least two laptops with me . . . plus cameras. One suitcase was full of magazines for ham clubs.

We checked into our hotel, took a short nap and met with Helmut Schmucker DL5KW, who took us via the subway to a great Bavarian restaurant. Four other hams arrived and we had a great dinner and talked hamming until I couldn't stay awake any longer.

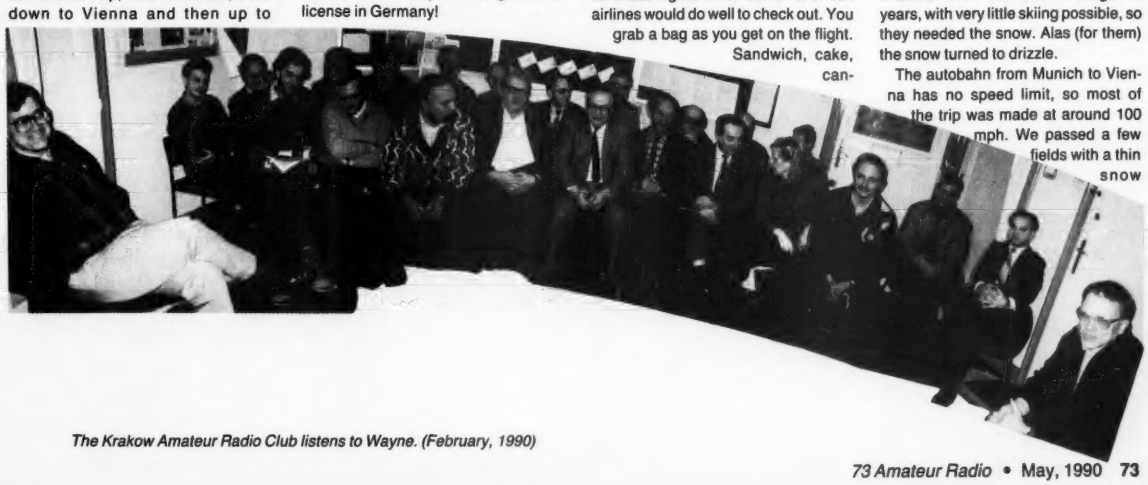
Helmut is an engineer working on the CERN Supercollider, so I had lots of questions for him. The group is finishing up work on a packet satellite and promised some articles on it for *73*.

The next morning a friend picked us up and drove us to visit the Pilz CD manufacturing plant on the outskirts of Munich. We talked over plans for making special CDs for some of my new projects.

That afternoon, Helmut took us by subway to the Deutsche Science Museum to see the special ham exhibit and station. When you get to Munich, don't miss it.

The next morning it was snowing . . . just what we needed to help our drive to Vienna. Europe was in the midst of the worst snow drought in years, with very little skiing possible, so they needed the snow. Alas (for them) the snow turned to drizzle.

The autobahn from Munich to Vienna has no speed limit, so most of the trip was made at around 100 mph. We passed a few fields with a thin snow



The Krakow Amateur Radio Club listens to Wayne. (February, 1990)

The Krakow DXers club.

cover and could see some snow in the mountains, but that was about all. Even if I'd had time to ski, there wouldn't have been much available. I'm glad I took a week in January for our yearly ham ski trip to Aspen. When are you going get off your duff and join us zipping down the slopes, HT in hand?

My ham meeting in Vienna went awry with crossed signals, so I didn't meet the hams this time. I was disappointed to learn that my old friend OE1FF had passed away a couple years ago. I had enough other meetings to keep me busy...with a nice lunch at the Hotel Sacher while arranging to swap ham articles with an Italian ham magazine publisher...and coffee at the famous Cafe Mozart with a writer proposing some articles for *CD Review*.

Now the big deal...Poland. The idea was to drive across Czechoslovakia to Krakow. I had FAXes from the Krakow club saying they were waiting for me. I got a shock when I filled the gas tank in Vienna...$50! Gadzooks! I had to leave Sherry hostage and go back to the hotel and change dollars for more shillings. I never expected to pay $4 a gallon for gas.

Not knowing what the gas situation would be in Czechoslovakia, I topped off again when we reached the Czech border. That turned out to be a very, very good idea. There was such a long line waiting to get into the country, it took an hour to go one block. The border was right in the middle of a town!

The Austrians waved us through. The Czechs stamped in our two-day visas and then demanded that we buy $72 worth of their money. "Don't worry, you can use it to pay your hotel bill." Sure. Welcome to the Czechoslovakian Soviet Socialist Republic.

The roads weren't bad. Two lanes. I did have to pass a lot of lumbering trucks, but there were very few cars. By going 90 in the clear spots I managed to average about 45 mph. Here and there they had superhighways, but mostly it was country roads that went right through the middle of one small town after another. The really depressing thing was the air pollution in almost every city. Their cars, trucks and industries are terrible. How can they ever afford to clean up the mess?

The line at the Polish border was about the same as the Czech...took about an hour. No one at the border spoke a word of English. They took our passports, stamped them, passed them along to the next chap, more stamping. Finally they gave 'em back and waved us on. I got into the car and Sherry found they'd kept our two-day Czech visas. I rushed back to get 'em back so we could re-enter the country and drive to Prague. The whole place was deserted.

I finally found someone in charge and discovered that we were not going to get our visas back. El tough-o on the two days. Ditto our wishes to re-enter the country. Ditto our $72 worth of Czech paper. I'd have to get new visas from their consulate in Kadowice, Poland. Drat!

Oh well, Kadowice was only about 35 miles off our route to Krakow, so we headed there. We made it in less than an hour. The little dot on my map turned out to be a good-sized city. You don't know fun until you've tried to find a foreign consulate in the middle of a large city where no one speaks English. But, with the patience of the Poles, we found it on a back street. The sign on the door said visa hours were 8–12 Mon–Fri. It was now Friday at 3 p.m. This couldn't be happening.

I had appointments in Prague on Monday with the president of the radio club and with their state music company. I tried the intercom at the consulate gate. A nasty woman answered. She did not speak English, except for, "Monday, 8 a.m."

In my mind I ran through all the applicable curses I could think of. I thought of a wide assortment. Then, still grumbling at the CSSR and rotten communist bureaucrats, we drove on to Krakow. Our reception there made up for the frustrations with Czechoslovakia.

Yes, I suppose we should have known to get both transit visas and visiting visas, but it's been a long time since I've run into that baloney...and the Czech embassy didn't mention it when we applied.

It only took three enquiries to find our Krakow hotel. I'm getting good at this stuff. A Holiday Inn, no less. Cheap, too! I sent FAXes to the Prague radio club, to the music group and to our embassy in Prague. You know, Shirley Temple Black. I got back fast FAXes from OK1BW and Supraphon...zilch from Shirley.

On Saturday the Krakow club met and I talked with them for several hours. They had about 40 hams present. The president, Henryk SP9JPA, is an interpreter by profession so I was in excellent hands.

Now, if you think you have problems finding parts, just ask the next SP you talk with what it's like in Poland. With the average monthly paycheck in Poland being around $40, few hams can afford commercial rigs.

The club was facing a major problem. When the government ran amateur radio they provided the club station and meeting room free of charge. Now the club was faced with having to pay $20 a month for the space...and the promise that this could triple or worse by the end of the year! Where would they ever get that kind of money?

I pointed out the importance of their attracting lots of youngsters to amateur radio as a way to make sure that Poland would have engineers and technicians. I suggested it might be possible to get American radio amateurs...particularly those from Polish families...to dig old ham rigs out of attics, cellars and garages and send them over...even if some needed fixing.

They're going to see if anything can be done with the new government to get the Polish airline to help ship used ham gear from America. The country won't be able to do much without a large supply of technically interested youngsters so they may get government cooperation.

Many years ago I arranged a similar deal for the hams in Jordan. Many American hams donated ham gear and technical books. The Royal Jordanian Airlines shipped them over and the clubs did the distribution.

The ham spirit I found in Poland was the way it was here in America back 30 years ago...before Incentive Licensing gutted our growth and our ham clubs. It was exciting to talk with them.

This group, despite all its problems, has six members licensed for packet, has several serious DXers, and is even putting its first repeater on the air. I've seen a lot less activity in some pretty big American clubs.

Dinner at the hotel restaurant was first rate and cost about 1/6th what I expected.

The Czech visa debacle gave us an unexpected extra day in Krakow, so Henryk took us to see their famous salt mines. It's worth the trip, if you're going to Poland. They've been in regular use for seven hundred years and go thousands of feet down. We visited a large church, a beer hall and even the place where Hitler set up to make airplane engines, with the first engine completed the day the war ended...all deep underground. It takes several hours to see everything. They have a museum showing how the mine used to be worked centuries ago...a model of the town a century ago...and many interesting exhibits.

The Krakow club is planning to set up a station deep in the mine next year and get a special call to commemorate the 700th year of the mine. A SP700 prefix. That will go well toward your WAM (Worked All Mines) award.

My gas tank was in the red again. The only gas pump in Krakow with unleaded happened to be right next to our hotel, so I filled 'er up...$20. That's more like it.

Our visit to Krakow was great. The only downer was the failure of the chap from the Polish record industry to keep his appointment. The hams knew several local producers of Polish folk and country music, so I'll follow up their leads when I get back.

Monday we zipped up to Kadowice and got our (grumble) visas. Then on across the (grumble) border with no problems (for a change). It was a long drive to Prague...360 miles, but half

of it was on superhighways. We got there just too late for a meeting with the Czech record company, Polyphon, so I set it up for 8 a.m. Tuesday. Antonin OK1GW, the president of the Czech Amateur Radio Society, would meet me at 10 and we'd have lunch with his son OK1BWG at noon. Then off to Munich.

The people at Polyphon couldn't have been nicer. I think I'm going to be able to help them considerably with selling Czech music. This should help bring them desperately needed hard currency, now that the company is no longer state-run.

The Czech amateurs are very excited over their new freedoms. I've been promised a steady stream of news on that front. Antonin is a scientist working on infrared detection materials and his son is importing PC Clones from Taiwan, so I had hours of QSO to pack into a couple hours. Once you start asking, it's amazing what interesting people you can find on the air . . . if you ask for more than a QSL.

For the first time in 40 years, Eastern European hams are free to actually talk over the air. I think you'll find them excited over this new freedom and anxious to use it . . . so start asking 'em questions and sit back.

Despite the short time I had available, Antonin took us to see the Smetana memorial overlooking the Moldau River. I hope you're into classical music enough to be familiar with his "Ma Vlast" (my country), which includes "The Moldau." We also hurried through the old section of town, my camera snapping in every direction.

I wanted to capture the way it felt. We had a beautiful warm sunny day . . . in the 60s. There were crowds everywhere, some walking around happily, others patiently on line to buy hot dogs or ice cream cones. The cones were small and cost 25¢. They haven't invented hot dog buns yet, so you get a slice of rye bread and a dab of mustard on a paper plate. We also got on line for some rather greasy potato pancakes. Their subway was clean, fast and crowded.

By 2 p.m. we were checked out of the hotel, but we needed gas. Antonin knew where there was an unleaded pump . . . I think it was the only one in Prague. He led us there and then waved to us as we took off for Munich.

With the nice weather, once I hit the German autobahn I was able to drive at 120 mph all the way to Munich. When we arrived I got my travel folder out of my suitcase so I could call and confirm a dinner date. The business card with the needed home phone number was missing. I never lose anything, so I was incredulous. I went through everything we had and no card. I was supposed to call Helmut, but his card was missing too! Rats.

We were tired enough so we shrugged, packed up for the flight home the next morning and went to bed early. It wasn't until a week later, when no amount of unpacking turned up the missing cards and several letters with FAX numbers, that it hit me. That chap who was always standing by the elevator at our Krakow hotel and whose only job seemed to be to rush over and push the elevator button for us . . . could he have been a security policeman? Perhaps he wasn't just calling the elevator, but was warning whoever was going through our room. Well, I hope some ham and record company business cards and my missing letters will keep them busy until Poland figures out how to get their security people more productive work. And I was feeling guilty for somehow managing to lose the cards.

I'd like to hear from some Polish, Czech and other Eastern European Americans who'd like to get involved with helping solicit and ship ham gear to these countries. I can't think of a better use for a no-longer-needed rig. I'm sure almost every one of you has some old HTs, old tube gear and so on. We can help our newly-free fraternity brothers in Europe . . . but we're going to need someone to organize the projects. Yes, I'll do everything I can to help . . . and *73* will be solidly behind you. Here's our chance to personally help some new democracies work.

You know, it didn't take much money to make this trip. It's probably one you could have made, if you'd bothered. You just have to watch for travel bargains and take advantage of 'em.

There We Were . . . At 750 Feet!

Ask me how Wayne managed to be at the helm, piloting a nuclear hunter-killer submarine deep below the Pacific Ocean. Glad you asked. Piloting? Well, it's just like flying, complete with an aircraft-type steering wheel. You even wear a seatbelt . . . and need it.

Note the fiendish look on my face as I put the boat into a 33-degree up angle which has everyone aboard holding on for dear life. My old shipmates groaned in dismay when I sat down in the pilot's chair and took the helm of the SSN677. Many of them still remembered my legendary feats of helmsmanship on the SS228 some 46 years ago, when we were busy sinking Japanese ships.

Our old Drum (SS228) is tied up permanently in Mobile in Battleship Park. If you ever get a chance, pay it a visit. I think you'll enjoy reading about our adventures on the plaques as you walk through the boat.

Thirty-eight of us old Drum crew members were given an opportunity to go for a cruise on the new Drum (SSN677) . . . and that's how ol' Uncle Wayne ended up sitting in the pilot's chair, swooping around under the Pacific Ocean, obviously endangering 160 lives.

I started hamming seriously in 1938 so when WWII came along in December 1941 I was 19 and prime cannon fodder. I was going to college, but the Draft Board said never mind about that, we have some empty trenches just your size . . . we need you just as you are. So I quickly joined the Navy in 1942 as a Radio Technician, went through one of the best electronic schools in the world and reported aboard the Drum in 1943. I made five

Nuclear Drum SSN677 surfacing.

"Hold tight . . . here we go!"

war patrols and left it shortly before the end of the war in 1945 to teach submarine electronics at the New London sub base.

Yes, I saw plenty of action . . . heard lots of depth charges . . . and we ran up a darned good score. I kept everything electronic working, was the radar operator when we were at surface battle stations, and ran the sonar when we were submerged.

Today's nuclear subs are bigger, but they have so much stuff crammed into them that the crews have less room to move around than we did 45 years ago.

You know, if you've a grandson who would like to learn electronics, I'll bet the Navy school on Treasure Island is still tops. It made my college electrical engineering education look like a dreadful waste of time. The Navy training gave me the grounding which enabled me to easily cope with every new technology which came along. It made it so I was able to help pioneer NBFM, RTTY, SSB, SSTV, repeaters, microwaves, microcomputers, speaker design, etc.

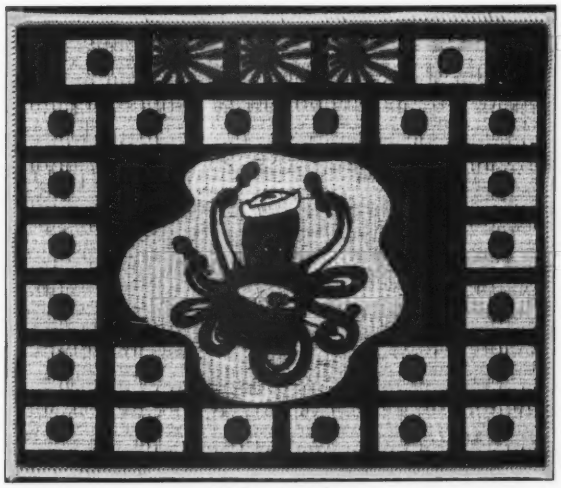
The recent collapse of the Communist system, if it is followed by the expected Soviet military budget cuts, could significantly lessen the importance of nuclear submarines. I loved the *Newsweek* encounter group cartoon where Fidel is sitting there groaning about the collapse of communism. Beside him is sitting the Pentagon groaning, "I know, I know."

The only real purpose for our nuclear submarine fleet is to counter the Russian nuclear subs. Sure, a few Third World countries have submarines, but they're old diesels and their crews are poorly trained.

Perhaps, if we pull our military forces out of Japan, we can get the Japanese to rearm and then we'll have to match them submarine for submarine, bringing happy days back to the Pentagon. The cost of rebuilding the Japanese military would also put an end to their cash surplus problems. Spending billions on military weapons which bring in no revenue will cool any country's economy.

Perhaps you'd better get your grandchildren into that electronics course pretty soon. Without the need for a huge navy and a big fleet of submarines, we're not going to need all those Navy electronic technicians.

But you know, after seeing the state of submarine electronic technology today, I felt a momentary twinge of regret over not having gone to work in the Anticosti Naval Research Lab, the way they wanted me to. Just momentary. 73



The Drum battle flag.

ASK KABOOM

The Tech Answer Man

Michael Geier KB1UM
PO Box 64766
S. Burlington VT 05406

Power!

Once and for all, the correct Digi-Key part number for the Flavorig 10 mH choke is M7103. Not M70103 or M7100. That said, let's get started.

Absolutely everything that happens inside your equipment depends on one thing: power. Without it, your transceiver is useful only as a paperweight. Of course, this power usually comes from the AC line, but it can also come from batteries or even solar panels. The source does matter, but just about all the power used in today's equipment must be "purified" into steady DC before use. Let's examine why and how.

Goin' through Changes

All electronic devices can be thought of as modulators. The term "modulate" means "to change," and that's what circuits do. They take unchanging DC power and modulate, or change it, so that it does something, such as convey information.

For instance, amplifiers modulate DC power so that it rises and falls in step with the incoming signal—that's what amplification really is. Oscillators make the DC rise and fall at a regular rate, and with a particular wave-shape. It's kind of like a violin string, which takes the steady (DC) pull of the bow and turns its energy into a back and forth (oscillating) motion.

A radio, of course, combines many functions to accomplish the complex goal of wireless information transfer. There are oscillators and amplifiers, perhaps digital switching circuits, and a speaker, meter, etc. But in the end, nothing happens without the raw material to modulate, and that's power!

Supply and Demand

It's difficult and sometimes impossible to separate intentional changes from those already present in the raw power, so it's best to start with the purest power possible. What makes power pure? There are two basic elements.

First, the power should have no inherent changes of its own. That is, it should be well-filtered DC, with no ripple or noise riding on it.

Second, the power should be regulated so that it doesn't get pulled up and down by the circuits it drives until it is actually in those circuits, well-isolated from its source. That prevents changes (signals) from one circuit from influencing another.

The first goal is met through the time-honored technique of filtering. After being rectified from AC to DC, the power consists of rising and falling parts of a sine wave—one hundred percent ripple! Involving capacitors and sometimes inductors, filtering has the effect of inertia. It makes the power resistant to changes, so that ripple and noise are flattened out. The basic idea is to store some power in a capacitor, and then release it when needed. When the supply exceeds the demand, the capacitor can be recharged. In practice, this occurs during each cycle of the rectified wave. Thus, as the voltage rises, it charges the capacitor. Then, as the voltage falls, the capacitor releases its charge, keeping the final voltage level from getting too low. It's kind of like squirting water 60 times per second into the top of a bucket, while drawing a steady stream from a hole in the bottom. As long as there's some water in the bucket, and you squirt as much in as you take out, it works. Voilà, filtered DC.

The second goal is met by making the power source big enough to handle the demands of the circuits it drives, and by monitoring the voltage level and continually adjusting it to keep it constant. And that leads us into our next topic.

Just a Little Math (Really!)

We use the term "power" to describe electrical energy, but that's not exactly what it means. Electricity has two important elements, current (amps) and voltage (volts). Current refers to the number of electrons, and voltage is the "kick" or charge on each one. The power in watts is the current multiplied by the voltage, and represents the amount of work the electricity can do. Now that wasn't so bad, was it?

Nearly all circuits are operated at fixed DC voltages. As the resistance of a circuit varies up and down with the signal it is generating or processing, the amount of current (and thus the amount of power) varies with it. Much of that power winds up as the circuit's output signal, with the rest dissipated as heat. (That's why equipment gets warm.) So, if your power supply cannot deliver enough current, parts of that signal are going to become distorted. Also, the supply voltage may wiggle up and down, causing remnants of the signal to appear in other circuits (horrors!). Enter regulation.

The Regulator

No, it's not a new Arnold Schwartzenneger movie. Although it could be. The regulator keeps an iron fist on the voltage, ensuring that it will stay constant despite changing loads. Of course, there must be adequate current in the first place. No regulator can make something out of nothing. In fact, most regulators operate by *wasting* excess power and dissipating it as heat. Actually, there are two basic types: linear and switching. Let's examine each.

A linear regulator acts like a variable resistor, and is placed in series between the filtering circuits and the load. The regulator monitors its own output voltage and changes its resistance to keep that voltage constant. Of course, a resistance can only cut the voltage down, so it must be higher at the regulator's input than will be desired at its output. As the regulator varies, cutting the voltage down just the right amount to keep it constant, it burns the excess power (equal to the difference between the input and output voltages, multiplied by the current flowing through the regulator) and gets hot.

Despite its wasteful nature, the linear regulator is widely used. It is simple, reliable, and generates no electrical noise of its own. That last attribute makes it especially desirable for radio work, where any generated spikes or other noise can get into the receiver.

I'D Rather Switch

Switching regulators operate on an entirely different principle. Instead of acting like a resistor, a switching regulator acts like its namesake, a switch, rapidly turning on and off to provide just the right amount of power to the load. Imagine a switch turning on and off 1000 times per second. The input to the switch is unregulated DC. The output is filtered, and then the load. If, during the course of one cycle, the switch spends as much time on as it does off, then it is operating at 50 percent duty cycle. If it spends only 10 percent of the cycle turned on, then it is at 10 percent duty cycle, and so on. Now let's add a circuit which monitors the output voltage after it has been re-filtered into DC, and adjust the switch's duty cycle to keep the output stable. This technique, called Pulse Width Modulation, represents the basic scheme of all switching regulators.

The big advantage of the switching regulator is that it doesn't burn excess power as heat. It simply blocks it, kind of like allowing only enough water to squirt into the bucket to keep the level stable. That makes this type of regulator tremendously more efficient, and much cooler, than the linear type. Unfortunately, it also introduces a potential problem.

Hash City

The rapid on and off switching of large amounts of power generates strong harmonics which reach far up into the RF spectrum. In other words, noise. When such a switching circuit is incorporated into a device designed to detect fractions of a microvolt of signal (in other words, a receiver), the potential for trouble is enormous. It is quite difficult to completely eliminate the noise because it is radiated from the wires entering and exiting the supply, as well as from the supply's components themselves.

But it can be done. There are a few supplies sold for radio use which incorporate switching circuitry, and they perform rather well. They cost considerably more than linear units, though, both because of the shielding problems and the increased complexity of their circuitry.

In the Beginning . . .

Now that we've explored regulators, let's look backwards through the power supply to where it all begins. There's more than one way to skin a synthetic fur, and it turns out that the switching regulator concept can be expanded to the design of an entire power supply!

In a traditional linear supply, the incoming AC power is passed through a transformer, where it undergoes voltage-to-current conversion. That is, its voltage is reduced while its current is increased by the same ratio. Remember, a watt is a watt. If you have 120 volts at 2 amps going in, you can change it to 12 volts at 20 amps and still have the same number of watts. In practice, there's some loss in the transformer, so the conversion isn't perfect. But for all intents and purposes, that's how it works. Then, the low-voltage, high-current power is rectified and filtered as I described earlier.

This approach to V-to-C conversion works fine, but the required transformer can get big and heavy when lots of power is needed. As I hinted above, there's another way.

Faster, Faster

The basic reason the transformer needs to be large is that the frequency of AC power is very low (60 Hz), and the iron transformer core will become saturated with magnetic force during the cycle and limit the amount of transferred power, unless that core is pretty big. If, however, you make your AC power have much higher frequency, say 20 kHz, then you can use a *much* smaller transformer for the same amount of power conversion, because considerably less power needs to be transferred per cycle.

Switching power supplies rectify and filter the incoming AC into DC right off the power line, with no transformer. Then, they chop it up at high frequency, pass it through a small transformer, re-rectify and filter it at the other end, and send it on its way to the load.

But what about regulation? Well, that's easy. Remember the switching regulator? Just make it adjust the duty cycle of the chopping oscillator, instead of a separate one. That way, just the right amount of power will flow into the transformer so that, after filtering, the output voltage will be where you want it.

It sounds simple, and in theory it is. In practice, though, lots of problems crop up, most of them associated with the fast switching pulses used. Various monitoring and protection circuits are incorporated to prevent the supplies from self-destructing from power line transients, short circuits in the load, and so on. So, switching power supplies tend to be complex and expensive.

By the way, nearly all desktop PCs use switching power supplies, and they are finding their way into radio gear as they are made spectrally quieter. Next month, we'll look at troubleshooting power supplies, both linear and switching.

Have a question? Send them to KB1UM at the above address.

ABOVE AND BEYOND

VHF and Above Operation

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MMIC Amps in Application

This month I would like to give several applications using MMIC amplifiers, including some high power amps. Our first example shows an MMIC amplifier providing switching protection to an expensive preamplifier. This project was published courtesy of the North Texas Microwave Society's newsletter, *Feedpoint*, from an article by Al Ward WB5LUA.

MMIC Converter Protection Circuit

Have you ever experienced the thrill of blowing out your rear end—that is, your transverter—by transmitting the 144 MHz IF into the down converter instead of the up converter? What you may not realize is that the action of pushing your PTT switch causes your 2 meter rig to transmit some amount of power in the form of audio noise. If you are daring and run VOX, break-in CW, or FM, the full power of the 2 to 10 watts is available at the output of the 2m rig. This is enough to gobble up any transistor fuse.

You say you have a relay in your transceiver that connects the 2m rig to the appropriate UP/DOWN converter, and that it's controlled by the 2m's PTT? The relay is an electromechanical device and may take as long as 50 milliseconds to switch, whereas the T/R switch in the 2m rig generally has fast switching pin diodes in the nanosecond range (1/1000 of a millisecond).

A solution to the problem is to build a box that has zero loss (gain = 1) in the forward direction and infinite loss in the reverse direction. This device is placed between the output of the down converter and the IF switch. See Figure 1. This allows the received signals to be coupled from the down converter to the transceiver with minimal loss. However, if high power were accidentally transmitted back to the down converter before it could be switched out, the signal would be attenuated enough to avoid "rear-end blowout."

The schematic in Figure 2 shows the circuit that offers low loss in the forward direction and 40 dB of loss in the reverse direction. I built it using whatever was on hand, and I tested it by cramming 10 watts of signal into the output and measuring the power that came out of the input.

In this case only 1 mW was measured for an isolation of 40 dB. Keep in mind that the resistors are only rated for several watts continuous, so 10 watts for a few milliseconds should not cause a problem. The MSA-0104 or MAR-1 will idle at 21 mA and only rise to 22 mA when the amp/attenuator is belted with a 10-watt signal. The only disadvantage is that the low level signal 1 dB compression point of the down converter has been reduced to about −20 dBm at the input of the amp/attenuator.

The current is optimized for the selected MMIC amplifier with the load resistor to set the desired current gain curves. See Table 1. The values listed are for optimum performance at 1000 MHz (1 GHz). You can home-brew the RFC by selecting a high value, ¼-watt resistor (1 meg) and winding about 12 turns of #36 wire on it. This will equal about 1 µH, and result in a good RFC.

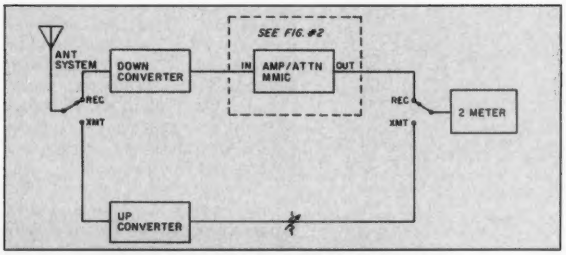

Figure 1. Block diagram of MMIC protection circuit.

Basic Amateur Band Preamp

The next application is a basic preamplifier using an Avantek MAR-0685 or Mini Circuits MAR-6 MMIC device (same part as far as I can tell). This preamplifier gives stable gain from 144 MHz to 2304 MHz, with a low noise figure to boot. See Table 2 for MMIC gain and noise figure data for each of our VHF bands.

The MMIC test amplifier was built on a small piece of microstrip PC board using chip capacitors on the input and output of the amp. The striplines are 50 ohms impedance and are terminated in a coaxial connector for easy mounting in a shielded box. The power is brought in with a feed-through capacitor. With DC voltage at 13.8 volts, the current drawn is 16 mA. See Figure 3 for the schematic details. Again thanks to Al WB5LUA for the circuit and test data. I have built several of these, and I use them for just about everything.

High Power Gain Blocks

Other high power gain blocks of interest to amateurs are in the Mitsubishi M577XX series of modules. The 1296 power amplifier module shows the M57762 rated at 20 watts output. The circuitry required to place this module and similar modules into operation is not complicated, since their input and output impedance is fixed at 50 ohms. Complicated matching circuitry isn't necessary.

Mitsubishi is not the only manufacturer of these devices. Motorola, TRW, NEC and a few others make similar power amplifier modules. These devices are made for so many different applications, it makes the head swim. My main point is that you should be aware of their existence, and if you locate one, you will know it can make a fine amateur gain block. If you run into a module that you can't identify, drop me a line and I'll see if I can help you locate information on it.

While Mitsubishi and Motorola gain blocks (power amplifier modules) are a little expensive ($50 to $70 each), they are easy to use and are worth the cost. The North Texas Microwave Group gets credit for a 1296 MHz amplifier circuit using one of the Mitsubishi 1296 power modules. See Figure 5 for details. The Motorola modules are used in a similar fashion, operating directly from positive 12.5 volts DC. See Figure 4, a 450 MHz amplifier using a Motorola power amplifier module.

In Figures 4 and 5, some of the fine details are left off, such as relay switching on both the power amplifier modules. In the case of the 450 MHz power module, note the easy construction. Just simple input and output RF connections, and bypassing on the DC voltage source. In Figure 5 the bypass and switching is a little more complicated because the module requires a switched 9 volts on transmit. The base of the 2N2222 switching transistor is keyed with positive 8 volts from the transceiver to provide this switching function.

Surplus CATV Gain Blocks

Some of the modules were made for cable TV. They are quite broad-banded in frequency, and make very good low power amplifiers for the amateur service. These modules might be easier to obtain through junk or scrapped CATV units. I have interfaced the output of a mixer with low power CATV modules, making a pre-driver for power amplifier stages. It worked very well. These modules have been used in projects for various amateur VHF frequencies, including 50, 144, 450 and 1296 MHz.

Power output of most CATV modules

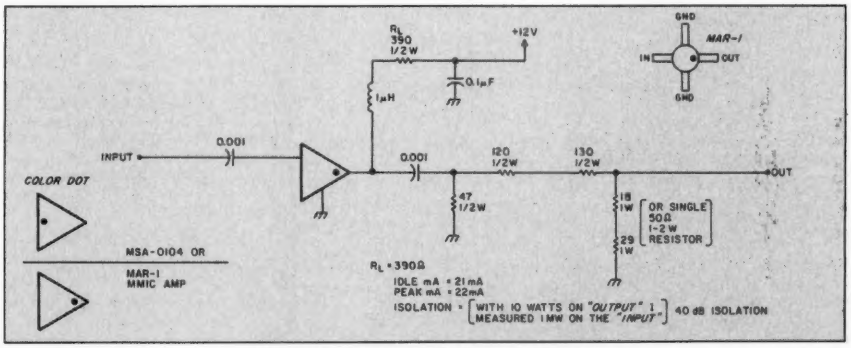

Figure 2. This circuit prevents "rear-end blowout."

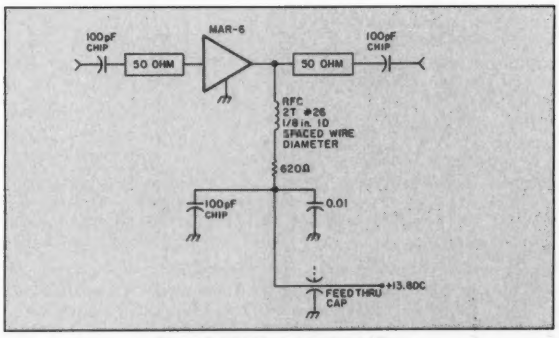

Figure 3. VHF Broad-band amplifier.

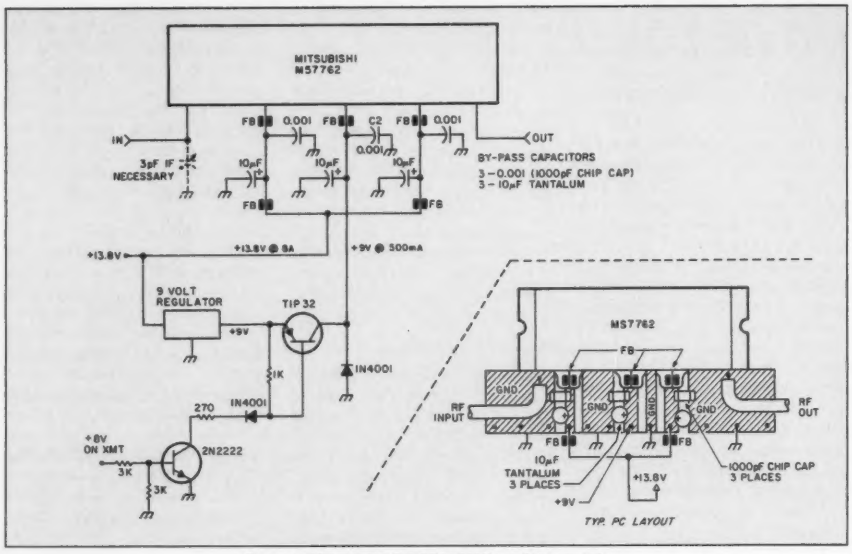

Figure 4. Mitsubishi 1296 MHz 20 W amplifier module.

Table 1.

Device	Max. mA	Normal Current mA.	Approx. Gain 1-GHz
MAR-1	40	20–30 mA	18 dB
MAR-2	60	30–40 mA	13 dB
MAR-3	70	30–50 mA	12 dB
MAR-4	85	50–70 mA	8 dB
MAR-6	50	15–25 mA	17 dB
MAR-7	60	25–40 mA	13 dB
MAR-8	65	30–50 mA	23 dB

Table 2.

MMIC Amplifier Performance

144 MHz	18.2 dB	2.7 dB N/F
220 MHz	18.3 dB	2.6 dB N/F
432 MHz	16.5 dB	2.8 dB N/F
902 MHz	15.0 dB	2.9 dB N/F
1296 MHz	13.0 dB	3.5 dB N/F
2304 MHz	8.8 dB	4.2 dB N/F

Table 3.

Mitsubishi	M-57762 1296 MHz	20 W
	M-57737 144 MHz	Power amp modules
	M-57735 50 MHz	Power amp modules
Motorola	MHW-720 450 MHz	20 W gain 21 dB
	MHW-802 825–915 MHz	2 W
	MHW-5122 40–450 MHz*	CATV type SYM to TRW
	MWA-110 thru MWA-310	General purpose hybrid
	DC–600 MHz	Amp TO-5
	MWA-5121 30–900 MHz*	27 dB gain 4 dB N/F
TRW	CA-4815H 10–1000 MHz*	17 dB gain 300 mW
	CA-4101 40–400 MHz*	17 dB gain 250 mW

*Gain Blocks (Modular) and CATV type Amplifier Modules

runs from about 100 mW to just over 400 mW for the higher power devices. Just about right for moderate drive to an amplifier. These CATV modules are available from both Motorola and TRW, as well through surplus CATV discards. (Table 3.)

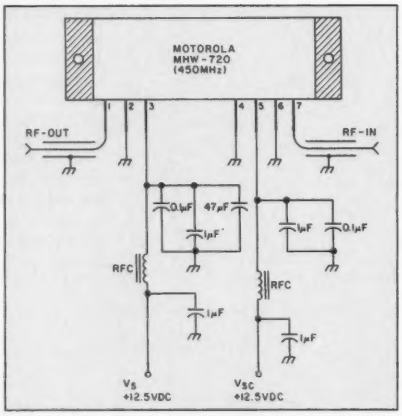

Figure 5. 450 MHz 20 W power hybrid amplifier from Motorola 21 dB gain.

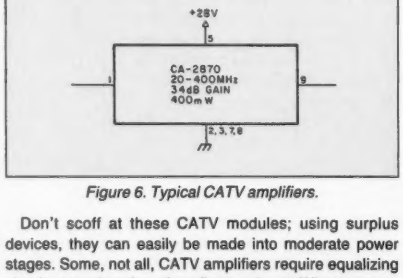

Figure 6. Typical CATV amplifiers.

Don't scoff at these CATV modules; using surplus devices, they can easily be made into moderate power stages. Some, not all, CATV amplifiers require equalizing circuitry to adjust them for a flat passband. Whatever type of device you locate, it will work well in amateur applications. Figure 6 is a schematic for an amplifier using a TRW 4815H module that I obtained from surplus.

This device worked from 10 MHz to just over 1100 MHz with 17 dB of gain, and a noise figure of 6.5 dB. I intend to use it to construct a converter for 902 MHz. This is the "basic building block" approach. It's low power now, but the final amplifier will depend on what I come across in my travels.

From the Mailbox

Jim WD0GTN wants to replace a klystron tube with a GUNN diode oscillator to convert it to solid state. He also wants to know if there are other interested microwave amateurs in the Wichita area. Jim also wanted to know how to convert from circular to rectangular. Circular (mode TE-11) can be converted to rectangular (mode TE-10) by using a dielectric lens. This is just a piece of Teflon™ cut in such a way that microwave energy refocuses as it passes through the material. I described a 10 GHz Polaplexer using this method with details for construction in the October 1988 issue of *73 Magazine*.

Tom Lloyd wanted more information, which I've been collecting, on 6 meter beacons. If you have any beacon information please send it to me, as I am compiling a new beacon list to be published soon. Gary AL7IH is building a 10 Ghz amplifier and reports Microwave Components of Michigan has changed their phone number.

Many readers want to know where they can buy components and PC boards for microwave projects. Some dealers require a large minimum order. Most amateur purchases tend to be small. If you can place a large order, as I sometimes do, you can get the minimum price. That is why from to time to time I offer parts and PC boards for projects at a nominal cost. At present I have in stock both 0.015 and 0.031 double-sided Teflon PC board material. A 4" x 5" PC board of 0.015 or 0.031 Teflon is available for $8 postpaid.

Suppliers for Microwave Components

California Eastern Labs handles NEC transistors, diodes and microwave GaAsFETs. Small purchases are allowed. The main offices are in Santa Clara, California, and the phone number is (408) 988-3500. I've dealt with them many times and highly recommend them. Also the Mitsubishi and Motorola power modules as well as an assortment of RF transistors are available from RF Parts, 1320-16 Grand Ave., San Marcos, California 92069. Phone: (619) 744-0728. In future columns, I'll add to the list of companies that deal in specialized components. As always, I will be glad to answer any questions covering microwave and related topics. Send an SASE for a prompt reply.

[See "Updates" in this issue for corrections to the schematic for the FET amplifier in the February 1990 column of "Above and Beyond."—the Eds.] 73

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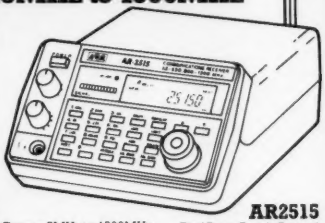

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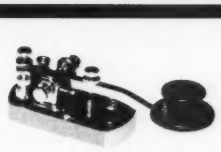

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More Huff-Duff Ideas

A few months back I conducted a mini-survey to check our preparedness to hunt down jamming on the HF bands. I started down the ARRL Official Observers (OO) list for a section of Southern California, calling those who were listed as being involved in HF monitoring. I asked each one if he (no YLs were on the list) was equipped to perform mobile radio direction finding (RDF) on any HF band. After getting three-quarters of the way through the list without finding anyone who could do it, I gave up in dismay.

Most OOs are very good at looking up a callsign and sending out a notice to a Novice with key clicks, but they can't go out and find a non-identifying jammer or noisy power line on the DX bands. There are plenty of mobile foxhunters to find repeater jammers on VHF-FM, but very few hams have equipped their vehicles for HF DF, or "huff-duff," as the military folks used to call it.

The Amateur Auxiliary needs your help. It's not difficult to track down HF jamming. Last month's column described the HF Homer, a simple RDF loop you can mount on your car and use with a mobile transceiver to hunt on the 10 through 17 meter bands. It has a SENSE mode to resolve the 180 degree ambiguity that plagues conventional loop designs.

Finishing Off Your Homer

By now your HF Homer should be built and ready to go, unless you couldn't find the variable capacitor. Just at press time, I learned that the Marlin P. Jones Company, the source I gave last month, has sold out of the AR-0091 air variables and will not be getting more. Fortunately, Surplus Sales of Nebraska (1315 Jones Street, Omaha NE 68102) has a good stock of Hammarlund miniature 100 picofarad air variables for $5.95 each, plus postage. The company's phone number is (402) 346-4750.

Photo A shows the loop mounted on the van, complete with compass indicator and pointer on the mast. When the photo was taken, I had not painted the loop and upper mast a dark color, as I usually do with such antennas to make them inconspicuous for hunting at night.

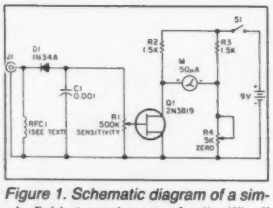

Figure 1. Schematic diagram of a simple field strength meter for "sniffing" with the HF Homer.

You can use the HF Homer with most 12 volt DC receivers, but some will work better than others. The receiver must be stable and well shielded.

Plastic case portables such as the Sony 2001-2003 series leak in too much RF and have excessive synthesizer noise, not to mention their lack of an S-meter.

Transceivers by the Japanese "big three" ham equipment manufacturers usually work fine, but make sure that the S-meter is sensitive and fast responding. Fast AGC time delay should be selectable in all modes. (On some rigs, AGC is always slow on SSB and fast on CW.) The ability to turn off AGC may prove helpful.

As you get into the neighborhood of the station you're hunting, the S-meter will read above S-9, where the meter scale compresses on most rigs. This makes it harder to use the SENSE mode. Turning down the RF gain control usually won't help. That typically causes the S-meter to stop working altogether. Only a handful of radios, such as the Uniden HR-2510, have RF gain controls that don't adversely affect S-meter function.

While a few receivers have internal RF attenuators, most require an external step attenuator box, such as the one shown between the mast and the transceiver in Photo A. Construction plans are in the T-hunt book, pages 55–60 (Moell and Curlee's *Transmitter Hunting—Radio Direction Finding Simplified* is available from Uncle Wayne's Bookshelf) and recent editions of *The ARRL Handbook*. The amount of attenuation switched in gives a clue to how close you are getting.

Huff-Duff Hunting Hints

Nearby power lines and other large objects can distort the pattern of RDF loops. Keep moving and take frequent bearings to average out these effects. Be sure not to get confused into hunting local noise instead of the target signal.

Remember that vertical loops give shallow nulls on skip signals. Test your HF Homer only on local ground wave signals. You're not going to hunt skip signals in your mobile anyway.

Sometimes when you rotate the mast to null a local signal, the received audio will begin to "echo" or get "watery." That is due to backscatter, the signal bouncing back via sky wave from some distant point. Backscatter usually is not a problem because you can determine the correct null direction by observing the quality of the audio.

Do not transmit into the loop or attenuator box. Disconnect your mike in case you forget. You may want to add a coax switch to select between the loop and your regular HF mobile antenna.

What about 20 and 40? The popularity of 20 meters means that it gets its share of malicious QRM. You can move the HF Homer to 20 by adding capacitance across C1 to reduce the resonant frequency. Add 82 picofarads to cover the 17 and 20 meter bands with tuning capacitor C2. The front-to-back ratio in the SENSE mode is not as good on 20 as on 15, but normal mode nulls are very deep.

Adding more capacitance to get to 40 meters isn't practical, because the loop signal pickup is too small on 40 relative to the "antenna effect." I have been trying out larger loops to get around that problem. An 81-inch circumference loop of the same ¼-inch O.D. copper tubing covers 40 with 330 picofarads added across C1. NORMAL mode nulls are a bit more shallow than with the 39-inch loop. In the SENSE mode, one null is deepened, and the opposite null disappears, creating a cardioid (heart-shaped) pattern.

Unfortunately, the larger loop on the HF Homer box is too unwieldy for mobile operation without some additional mechanical support. I plan to experiment more with the 81-inch loop on 40, and I welcome your participation and suggestions.

Closing In

To provide adequate documentation to help the FCC build a case, you must be able to conclusively demonstrate which house or apartment is the source of the signal, and preferably which antenna on the building.

There aren't many QRP jammers on the HF bands. To succeed at being disruptive, a jammer needs a good antenna and lots of power. Your mobile transceiver and attenuator won't be able to do close-in RDF because the strong signal will enter the receiver through the case and coax shield to pin the S-meter. The rig's RF gain control will not help when you are less than a block away.

A field strength meter (FSM), sometimes called a "sniffer," lets you use your loop to pinpoint the exact source of RF radiation by direction and amplitude. Figure 1 is the circuit of an untuned FSM that I designed to use with the HF Homer. Depending on the power and antenna that the jammer is using, the FSM begins to move up scale when you are three to six houses away, with the sensitivity control set to maximum. Reduce the sensitivity as you get closer.

All of the parts except the 50 microampere meter are at Radio Shack. You can probably find a meter at a local store or flea market. New panel meters are available for about $15 from Circuit Specialists, PO Box 3047, Scottsdale AZ 85271, (602) 966-0704 . Build the circuit in a metal box to minimize RF leakage, using a suitable RF connector to mate with the HF Homer cable (I use BNCs throughout my RDF system).

This FSM uses a classic bridge circuit to give good sensitivity with a single field effect transistor (FET). Sensitivity is about 20 dB greater than the unamplified units sold for antenna tuning purposes. Full scale on the meter with R1 at maximum is 30 millivolts, measured from 10 to 450 MHz.

Frequency response is so flat that you could use it as a sensitive RF voltmeter if you calibrate the meter and R1 with a laboratory signal generator.

About 3 milliamperes flows through Q1 when no signal is received, decreasing as the incoming signal makes the FET gate input more negative.

Photo A. The HF Homer system installed in the van, ready for hunting with a TS-130 transceiver and RF attenuator on the home-built center console. Coax and relay wires go inside the mast to the top of the tee-handle, then break out.

R2 balances the bridge so that the meter current is zero with no signal.

R2 has enough range to zero the meter whether the battery (alkaline transistor radio type) is fresh (9 volts) or aging (6 volts). Temperature changes also have a minor effect on balance.

Disconnect the antenna from J1 when setting R2 for zero. If you can't balance the bridge, the quiescent drain current of Q1 may be too high or low. If so, try another 2N3819 or experiment with the values of R2-R4.

The RF choke (RFC1 in Figure 1) is not required if you use the FSM only with the HF Homer antenna, because the Homer provides a DC return path.

Some other antennas, such as those with gamma matches, don't provide a DC return. You will need a choke to use them with this FSM.

Choose the choke carefully. RF chokes have self-resonant characteristics that can upset the flat FSM frequency response, even if the antenna has a DC return. For 20 through 10 meters, use a 15 microhenry choke such as Miller 70F155A1. For 2 meters, a 1.0 microhenry part is a good choice.

To use the FSM on both HF and VHF, use both chokes in series. Circuit Specialists carries the Miller chokes.

To sniff on foot, add a SENSE/NORMAL switch on the FSM box to supply HF Homer K1 coil voltage from the 9-volt battery through a 33-ohm ½-watt resistor.

Now you're all set to help rid the DX bands of illegal antics and electronic pollution! A final request: Please don't be a Lone Ranger. Join the Amateur Auxiliary and your Local Interference Committee by contacting your ARRL Section Manager. Working with the Auxiliary protects you and multiplies your effectiveness. 73

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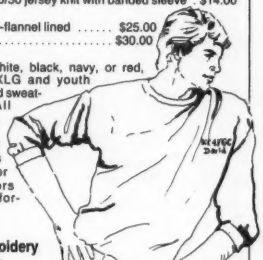

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Notes from FN42

Good news continued from the April issue: another new Hambassador! Mahmoud Idera-Abdullah EL2CE has volunteered to become the Hambassador to Liberia.

My trip to El-land this summer has unfortunately been cancelled. I had a wonderful conversation with Peter EI8GM on 10 meters right after I had submitted my April column. Peter told me to learn how to whistle because that is the easiest and cheapest way to bring up the repeaters in Ireland. When I do make my trip I'm sure I will have a lot of explaining to do to my wife and fellow travelers in the bus as to why I keep whistling. Anybody have any good excuses that are believable? (Mary already knows that the Irish girls are pretty.)

I received an inquiry from Melvin Seyle WA3KZR as to the address of West Siberia DX Club, the granters of the beautiful certificates that have been highlighted in the past six issues. Inquiries should be sent to: Sergey F. Kruglov UA9MC, PO Box 836, 644099, Omsk-99, USSR. I have a few of the requirements for the certificates but do not have the space here to put them in. I will put them on the 73BBS in the 73 International SIG.

Who will be next with some beautiful certificates, suitable for publishing and acquiring? Send them to 73 and we will see what can be done.

Now, on to the good stuff!—Arnie N1BAC.

Roundup

Brazil L.A. Cruz PY7AHJ reports that the International Amateur Radio Net, IARN, created by the late Gil Baker W5QPX is planning a world telecommunications celebration during the month of May to highlight Telecommunications Day.

Italy Mario Ambrosi I2MQP, Segretario Generale and DX & Award Manager of the Associazione Radioamatori Italiani, ARI, announces that the ARI International DX Contest will always be the third weekend in April from 2000Z Saturday until 2000Z Sunday. This year it will be April 20 to April 21.

Mario wishes to emphasize that this contest is now a worldwide competition and hopes that many of our readers will take part. [*We just received this info and hope that many of you will receive your May copy in time to take part.—Arnie*]

Japan From the JARL News: The JARL's General Assembly of 1990 is planned to be held on May 27 at Kanazawa City in Ishikawa Prefecture. This important General Assembly, held in May every year, adopts resolutions about a yearly activity program and budget with the opinions of JARL's members being faithfully reflected therein. Some 1,300 members from various parts of Japan gathered to attend the Assembly of 1989, held in Noboribetsu City in Hokkaido.

Latvia Ed Shakalis KA1QOF reports that during a conversation with Alex YL1WW it was mentioned that Latvia hams have a net operating weekends on 28.660 at 1400Z, 21.360 at 1500Z, and 14.390 at 0500Z. All frequencies used depend upon RF conditions.

It is also apparent that Latvia is now using the YL prefix and Estonia is using the ES prefix. [*I can attest to both because I too talked to Alex YL1WW on Feb 3 and to Vello ES1QD on Jan 27. —Arnie*]

Switzerland From the International Telecommunication Union (ITU) Press Release: The ITU and the Posts and Telecommunication Corporation of Zimbabwe (PTC) have agreed to organize jointly AFRICA TELECOM 90 at the Harare International Conference Centre (HICC) and the Sheraton Hotel in Harare, Zimbabwe, from 4 to 9 December 1990.

This event will be comprised of an exhibition and a Special Session of the World Telecommunication Forum, both to be held in pursuance of a Recommendation adopted by the ITU Plenipotentiary Conference, Nice, 1989.

Further information may be received from the AFRICA TELECOM 90 Secretariat, ITU, Place des Nations, CH-1211 Geneva 20, Switzerland.

AUSTRALIA

Ken Gott VK3AJU
38A Lansdowne Road
St. Kilda, Victoria 3183
Australia

Thirteen years as an editor of American-owned publications finds me sometimes a bit confused over respective US, UK, and Australian style and usage of the "English language." I think the US calls the device a "slingshot" and the British a "catapult." Colloquially, we call it a "shanghai." Anyway, I've always kept one with my gear for portable ham operations. With a ¼ inch lead sinker attached to some monofilament fishing line, and the line stored on one of those handcasters from which it will flow off freely, it is a superb means of getting a line over a high tree branch and pulling an antenna up via the line.

Imagine my shock and dismay when I learned last year that our VK3 state government had banned the sale and use of slingshots! So, I fired off a letter to the Minister for Police and Emergency Services, under whose jurisdiction the matter lay. Naturally my violin sang when I described the inestimable services rendered by amateurs in earthquakes, floods, fires, and other disasters, and the vital role of the catapult/slingshot/shanghai in the portable operations which provide our training for emergencies.

Behold the response: victory, triumph!

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I refer to your letter requesting an exemption from the above Regulations to enable the use of slingshots in the pursuit of your hobby as an amateur radio operator.

I am pleased to be able to tell you that the following exemption was recently approved by the Governor in Council: "Sections 4(j) and (k) [which relate to slingshots] do not apply to amateur radio operators where the articles are used in pursuit of that hobby."

[*Who says that our officials don't listen!—Arnie*]

I've already mentioned how the North American stations scooped all the low-numbered certificates for the WIA 80th Anniversary Award. I'm trying to set up some weekends where there will be lots of VKs on the air to enable more overseas amateurs to qualify for the award. Naturally, we have to avoid weekends which are booked for major national and international contests. Since the WIA 80 Award involves membership numbers from the VK contacts, QSOs made in contests won't serve.

We had our worst earthquake in Australian history in December and the only one in which lives were lost. It affected an urbanised area in Newcastle, second city in NSW. While I'm sure that amateur radio helped in the aftermath, I've got absolutely no details.

The quake took place in the run-up to our major holiday season, and at a time when all WIA broadcasts to members had ceased for a couple of weeks. When the WIA federal office reopened after the summer vacation, I called in but no news was on hand on the role of amateurs in the quake. As soon as information is available I will relay it to you.

Cheers, Ken, VK3AJU

[*I'm afraid that I messed up the date for Australia's National Day in January. Ken set me straight and I got a history lesson as well. I promise that I will never do it again.—Arnie*]

ISRAEL

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Hams and Rumania

Once again, in times of disaster, either natural or man-made, amateur radio provides communications where all else fails. In December, when the Rumanian revolution took place, multitudes of Israeli citizens were desperate for news about the well-being of their relatives in Rumania.

An emergency traffic net spontaneously came into being between here and the then beleaguered country, relaying more than 1000 health and welfare inquiries. In Rumania, Pit YO3JW, Andy YO3APJ, Cezar YO3YC, Dan YO3JX, and Ovidiu YO3BDP (all of Bucharest), Nelu YO6AWR of Brashov, George YO2BB from Timishuara, and Fery YO4BX of Constanza did outstanding work.

On this end the traffic was handled by Morel 4X1AD, Shalom 4Z4BS, Jan 4X6WB, Emil 4X6YU, Hardy 4X6VH, Paul 4X6UU, Micky 4X4FL, and Ilan 4X6VJ.

On another front, Eyal 4X6RE, a member of the Red Star of David (the Israel equivalent to the Red Cross) was coordinating with Rumanian hams, for the Rumanian Red Cross, the dispatch of a transport-plane load of first-aid supplies from Israel to the civil war stricken Rumania.

As in the past, when the chips were down, amateur radio operators proved themselves as reliable, efficient, untiring and selfless volunteers to help their fellow humans in the common effort to overcome calamity.

Silent Keys' Forest

The Keren Kayemet Le'Israel (Israel Forestation Authority) has informed us that from the beginning of this year, the fee for having a tree planted and the mailing of the certificate for people from abroad has been raised to seven dollars. See the previous edition of this column that detailed how one can have trees planted in the Silent Keys' Forest to either honor or be a memorial to someone.

Grade "B" Course Begins

The Center for Technological Studies of the Open University has started a new correspondence course for the "B" Class (General) license. They will conduct theory examinations, and will supply all the study materials. Applicants will be put in touch with ham clubs for learning Morse code. The cost of the course is 320 shekels ($160), and is no doubt well worth it, with the first-ever printed complete study guides in Hebrew for this license class.

Spotlight on 4X4HQ

When in other countries ham radio has turned into an old man's hobby, with the average North American radio amateur being in his fifties, the Israel Amateur Radio Club boasts the average age of its membership as 24 years old (statistics from 4X4GF)! Much credit must go to the youth clubs, the most prolific and longstanding being 4X4HQ, at the Tel Aviv Youth Center.

4X4HQ is open 5 evenings a week, Sundays through Thursdays. At present there are 50 people enrolled who are candidates for February's Novice examinations, and continue on

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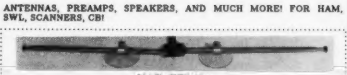

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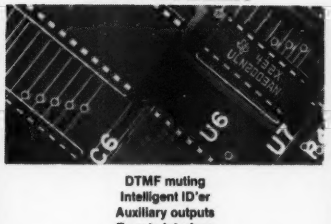

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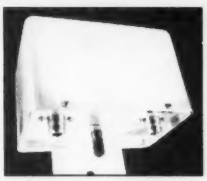

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to Grade B. Most are high schoolers, but there are also adults learning alongside eleven year olds! During the summer vacation the club station was open in the mornings, so the members had plenty of opportunities for hands-on operation.

Every Israel Independence Day, 4X4HQ does a special 24 hour operation, with a special callsign. This year it was 4X41ID celebrating Israel's 41st birthday; next year will be 4X42ID, of course! The station sports a TS430S transceiver and TL922 amplifier keeping a variety of antennas spewing out energy on the HF bands, while a FT227R on 2 meters keeps the HQers in touch with the inside of the country.

LIBERIA

Mahmoud Idera-Abdullah EL2CE
PO Box 20-4262
1000 Monrovia 20
Liberia, W.A.QL

The year 1990 is well underway and we are looking for bigger and better things for amateur radio for this present year, particularly here in Liberia. For one thing, we are very happy to appear regularly once more in the "*73* International" column. It has been a while since Brother "Don" Steffers EL2AL departed, June 1985 to be more exact.

Liberia, as most hams worldwide may not know, is on the west coast of Africa. It sits on what some might call the "Southwestern Bulge" of Africa, bordering Cote D'Ivore on the east, Guinea to the north, and Sierra Leone on the west.

For many amateurs it would be considered, at times, a rare DX country. Many have never had a contact with an "Echo Lima" station and relish the thought, so operating from Liberia can be quite exciting when the pileups come your way.

Liberia, like most African countries, is considered to be a "developing" nation. All things being equal, it might be more developed than many others in the "subregion."

Because Liberia is developing, ham radio is clearly developing as well. The Republic of Liberia is Africa's oldest sovereign nation, having declared its independence in 1847. However, amateur radio did not get started here until the 1930s. It was quite possibly the first country south of the Sahara to issue amateur radio licenses.

The first license issued to a Liberian was in 1938. Since that time there has been a steady but very slow growth of the number of Liberian-born amateurs. Their numbers lag far behind the number of expatriates that now hold amateur licenses here in Liberia. Liberians make up about 10% of the total number of hams licensed in 1989 by Post and Telecommunications, the authorizing government ministry.

Part of the slow growth is due primarily to the absence of an ongoing program of amateur instruction and education. Many of the amateurs who participate in these programs are often here for short tours of duty with an embassy, VOA, or a mission. Therefore, when they depart there is no one to step in and continue the program, creating a lack of continuity of license courses.

A second factor that keep Liberian amateurs off the air is the high cost of ham gear on this side, and its availability. If an individual is able to find a tutor, study materials, and the patience to master Morse code and theory, finding affordable equipment can be a big problem.

The Liberian Radio Amateur Association, the nation's radio society, is planning to take steps to help remedy the situation. Plans are being made to set up regular radio classes for all those interested. We would like the schools to be involved, maybe implementing an amateur radio course as part of the regular curriculum.

Also, in line with the effort to promote and create an interest throughout the country, a club station is being planned; land has been looked at, and hopefully construction can be started as soon as a final site is chosen. Of course this would be fully equipped, which would allow those without their own equipment to get on the air. These are only two small but significant moves to aid the development of amateur radio in a Third World country.

For these steps to be successful, it will take the efforts of both the local and the international radio community, their expertise, technical knowledge and experience, along with unprejudiced advice, for amateur radio to grow in Liberia.

For those that are genuinely interested, you can write for a sample copy of the LRAA Quarterly Newsletter, *Echo Lima News*. I would be glad to send you a copy.

Until next time, 73, from tropical West Africa. Let's work to develop amateur radio in a developing country.

LITHUANIA

Jonas Paskauskas LY2ZZ
PO Box 71
Siauliai, 2354900
Lithuania

The first ham convention, organized by the World Lithuanian Amateur Radio Net, will be held in Vilnius, the capital city of Lithuania, in early June. In addition to the convention, organized tours will be provided to the participants to historical sites and points of interest.

To date, 20 amateurs from Europe and the United States have registered to attend. For more information and registration, contact LY2ZZ by mail or on 28.444 (±) at 1500Z weekends and some weekdays. 73

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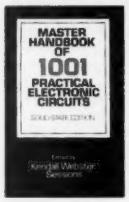

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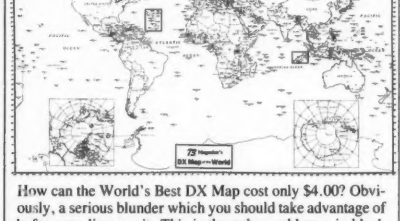

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20+ wpm—Congratulations! Okay, the challenge of code is what's gotten you this far, so don't quit now. Go for the extra class license. We send the code faster than 20 per. It's like wearing lead weights on your feet when you run: You'll wonder why the examiner is sending so slowly!

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. . . de K6MH

Who's Killing Ham Radio?

No more gloom and doom. We ain't dead yet. Having heard the rumors, us die-hards are searching far and wide for healers, herbs, nostrums, and holistic medicine to revive the hobby that was once the love of our lives.

Who, or what is doing in ham radio? Let's not harp on the incentive licensing fiasco, Wayne has covered that. Let's not mention five of the most respected hams in the country requesting the resignation of ARRL's president for failing to act in a way to protect our hobby. Nope. Let's look elsewhere.

The Fishbowl Effect

Why are telephone modem BBS's spreading like wildfire, while amateur radio just stands there looking?

One argument is that the phone BBS's are open to anyone. No license required. Private, QRM-free point-to-point communication is there for anyone with a computer and modem and a modest budget for phone bills. Friendly. Democratic. No one has to run the code-and-theory gauntlet.

Like the telephone, amateur radio is intended for point-to-point communication. But the nature of radio is that anyone who wants to can listen. Phone lines are private. Hams have no privacy.

Every ham who goes on the air might as well be living in a fishbowl. Anyone could be listening. Who knows what they might think if you should say the wrong thing? So we get timid people afraid to say anything except what they've heard someone else say. We have grandstanders who talk too much about nothing you can have any feelings about. We get all kinds of playacting. There are still hams who along with the Pope, refer to themselves as "We." It's stage fright, or mike fright, isn't it?—having to calculate what you can say instead of feeling free to say anything you wish. This uptightness could do us in.

On phone lines, we're guaranteed privacy by law. The opposite applies to amateur radio. The law requires that what you say be transmitted in standard modes. Inventing a new mode that works only between you and a friend is a no-no.

It's a public medium. We're public figures. It's like visiting a nude beach, your visibility may bother you til you get used to it. High visibility public figures do one of three things: overact, freeze up, or just be themselves anyway. The third response is our survival route, if we can relax and enjoy it.

It can be a kick to be "on the air." But the "act" some of us slip into is stultifying even to ourselves. Listen across the bands. Do you hear ham actors? Do you hear the dying yawps of Dodo birds? Is there hope for this endangered species?

Youth

Think of the exciting things you were ready to jump into when you were young. One summer when I was ten I wrote out a list called "Neat Things To Do" that ran to about 30" long in small print. Did you do that too or just keep them in your head? How much of your list have you shared with others, or even remembered for yourself in the last ten years? Did you get adult and proper and forget all about it? Are Tom Sawyer, Becky and Huck Finn still alive in there somewhere?

I believe that anyone who is alive and breathing has that same spark, that free spirit, even if it's nearly smothered under layers of garbage.

Wildness

Burned into my brain along with the beauty of Sierra Club nature photographs is their quote of Thoreau: "In wildness is the preservation of the Earth." Could this apply to ham radio? Please note that wildness does not mean getting drunk, putting a lampshade over your head and trying to be funny. It means being free, natural, and uninhibited. It means being yourself for all to see and hear, without fear. It's beautiful. It's fun. It IS wild.

Do you feel good letting would-be hams listen to our bands, or fear turning them off?

What if the bands were full of "wild" humans having a ball just being themselves? Recall the most fascinating talk show you ever wanted to phone in to. Couldn't a 2 meter repeater be that much fun and more?

We're not supposed to transmit music via ham radio. But unless we let some of the music in our souls sing out, our hobby could just dry up and blow away.

Eric Berne's *Games People Play* is based on the old saying: "If you are not stroked, your spine will shrivel up." How about contributing a few strokes to the backbone of ham radio: live messages, friendly messages, messages with juice? Forget your high visibility, or enjoy it. Be yourself, not the Pope, not Super-Ham, but YOU . . . expressing what YOU think and feel. It's wild. It's where the juice is. It's more refreshing than Coke. 73

PROPAGATION

Jim Gray W1XU

Jim Gray W1XU
210 Chateau Circle
Payson AZ 85541

Propagation conditions on the HF bands begins to decline from their March–April peak toward the normal summer conditions, although with the peak sunspot numbers about to occur for Cycle 22, conditions ought to be very good, indeed . . .

The first week of the month will exhibit fair-to-poor DX conditions with possible magnetic field upsets around the 4th, 5th, and 6th. Gradual improvement will take place through the 8th, and the following two weeks should provide generally quiet magnetic field conditions and good-to-excellent DX opportunities.

This period tends to be fairly stable, ionospherically speaking, so you should make the most of this opportunity to work worldwide DX. As June and July approach, keep a sharp ear peeled for super VHF-UHF propagation. As always, tune to WWV (10 MHz or 15 MHz seems best) at 18 minutes past the hour for the latest update on the magnetic field indexes (lower is better) and for the solar flux data (higher is better).

See you next month. 73

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	10	—	20	—	—	—	20	20	—	—	15	10/15
ARGENTINA	15	15/20	20	40	40	—	—	10	—	—	10/15	10/15
AUSTRALIA	10/15	20	20	20	20	40	20/40	20	—	—	—	10/15
CANAL ZONE	15	20/40	20/40	20/40	20/40	15	15	10	10	10	20	10
ENGLAND	20	40	40/80	40/80	40	—	—	15	10	15	15	20
HAWAII	10/15	15	20	20	20/40	20/40	20	20	—	—	—	10/15
INDIA	20	20	—	—	—	—	—	15	—	—	—	—
JAPAN	10	—	20	—	—	—	20	20	—	—	15	10/15
MEXICO	15	20/40	20/40	20/40	20/40	15	15	10	10	10	20	10
PHILIPPINES	15	—	20	20	—	—	20	10/15	10	—	—	15
PUERTO RICO	15	20/40	20/40	20/40	20/40	15	15	10	10	10	20	10
SOUTH AFRICA	20/40	40	20	20	—	—	—	—	10	10	15	15
U.S.S.R.	40	40/80	20	20	—	—	—	10/15	10/15	—	20	20
WEST COAST	20/40	20/40	20/40	40	40	—	—	10/15	10/15	10/15	10/15	20

CENTRAL UNITED STATES TO:

ALASKA	10/15	15	20	20	20	—	20**	20**	—	—	—	10/15
ARGENTINA	15	15	20/40	20/40	20	—	—	10	—	—	10	10/15
AUSTRALIA	10/15	15	15	—	20	20/40	40	20**	—	—	15**	10
CANAL ZONE	15/20	15/20	20/40	20/40	20/40	20/40	—	—	10/20	10/20	10	10	10
ENGLAND	40**	40/80	40**	—	—	—	—	—	15*	15*	20	20
HAWAII	15	15	15	20	20	20/40	40	20	—	10	10	10
INDIA	15**	15/20	—	—	—	—	—	15/20	15**	—	—	—
JAPAN	10/15	15	20	20	20	—	20**	20**	—	—	—	10/15
MEXICO	15/20	15/20	20/40	20/40	20/40	40	—	—	10/20	10/20	10	10	10
PHILIPPINES	10/15	—	20**	20**	—	—	—	—	10/15	10/15	—	—
PUERTO RICO	15/20	15/20	20/40	20/40	20/40	40	—	—	10/20	10/20	10	10	10
SOUTH AFRICA	—	—	20	20	—	—	—	—	15	15	15/20	20
U.S.S.R.	—	—	—	—	—	—	—	15**	15**	15**	20	20

WESTERN UNITED STATES TO:

ALASKA	10/15	10/15	15	20	20	20	—	20	20	—	—	15
ARGENTINA	10/15	15	15	20	20	—	—	—	—	—	10	10
AUSTRALIA	10	10/15	15	15	20	20	20	—	20	—	—	—
CANAL ZONE	10	15	15/40	20/40	20/40	20*	—	—	10	10	10	10
ENGLAND	20	20	—	—	—	—	—	—	15	15	15/20	20
HAWAII	10/15	10/15	15	15/20	20/40	20/40	40	—	15	10	—	—
INDIA	—	15**	20	—	—	—	—	—	10/20	15**	—	—
JAPAN	10/15	10/15	15	20	20	20	—	—	20	—	—	15
MEXICO	10	15	15/40	20/40	20/40	40*	—	—	10	10	10	10
PHILIPPINES	10	10	—	—	—	—	—	20	15	15/20	—	—
PUERTO RICO	10	15	15/40	20/40	20/40	40*	—	—	10	10	10	10
SOUTH AFRICA	20	20	—	20	—	—	—	—	—	10	15	15
U.S.S.R.	20	—	—	—	20**	—	—	20**	20**	20	20	20
EAST COAST	20/40	20/40	20/40	40	40	—	—	10/15	10/15	10/15	10/15	20

* Try next higher band on "G" days (1) Possible opening on this band on "G" days (2) Try 80m
Note A: Use values of 10/15 for 12m, 20 for 17m, 40 for 30m Note B: This chart refers to the highest band possible at the time indicated. If no luck, try next lower band

MAY 1990

SUN	MON	TUE	WED	THU	FRI	SAT
		1 F-P	2 F-P	3 P	4 P	5 P
6 P	7 P-F	8 F	9 F-G	10 G	11 G	12 G
13 G	14 G-F	15 F	16 F-P	17 P	18 P-F	19 F
20 F	21 F-G	22 G	23 G	24 G	25 G	26 G
27 G	28 G-F	29 F	30 F-G	31 G		

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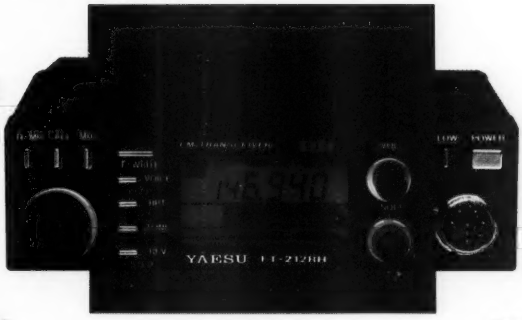
Power ...and More!

FT-212RH

Frequency Synthesized VHF/UHF FM Transceiver



The compact, versatile FT-212RH is a 45 watt, 2 meter mobile that boasts a lot more than just high power. Inside its sturdy compact frame hides an impressive array of performance features plus high reliability...like 18 general purpose memories; one-touch call channel memory; two scanning range memories; CTCSS on any of the 37 standard tone frequencies may be programmed into any memory channel. Choice of standard, or optional, high performance tone encoding microphones. The FT-212RH and its 35 watt UHF counterpart, the FT-712RH are packed with state-of-the-art refinements... power and more!

- **Frequency Range:** 140-174 MHz on receive (144-148 MHz TX—Modifiable for MARS and CAP). Specifications guaranteed on amateur bands only.
- **Power Output:** 45 watts output with selectable 5 watt low power.
- **CTCSS:** Access any of the 37 standard CTCSS tone frequencies, plus 97.4 Hz can be displayed, selected and programmed into any memory for transmission.
- **19 Memories:** Each memory stores either programmable repeater shift or independent TX and RX frequencies.
- **Automatic Repeater Shift (ARS):** Enables selection of repeater transmitter offset automatically when tuned to a standard repeater subband.
- **Programmable Scanning:** Scans band, band segment or memories. Scan auto-resume with carrier drop or after 5-second pause.
- **Tuning Steps:** Operator selectable steps in 5, 10, 12.5, 20 and 25 KHz increments.
- **CAT System Control:** Provides for external control of VFO frequency, mode and memory functions from operator's personal computer.
- **Amber Backlit LCD Display:** Automatically controls the brightness of the display backlighting and pilot lamps.
- **Tone Encoding Microphone:** Choice of standard, or optional high performance DTMF tone encoding microphones.
- **Digital Voice System (DVS-1):** Optional sytem which allows local and remote digital voice recording and playback.

FT-4700RH

Dual Band VHF/UHF Trunk Mountable FM Transceiver

• **Frequency Range:** 140-174 MHz on 2m (modifiable for MARS and CAP); 430-450 MHz on 70cm. • **Power Output:** 50 watts on 2m; 40 watts on 70cm. Selectable 5 watts low power on both bands. • **Full Duplex Cross Band Operation:** • **Dual Receive:** • **CTCSS Encode/Decode:** • **Remote Control Kit Included:** • **Amber Backlit LCD Display** and controls with dimmer switch. • **20 Memories:** • **Dual Antenna Ports:** • **Programmable Scanning:** • **MH-15C8** Mic standard: **MH-15D8** Mic optional.

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TH-26AT/46AT

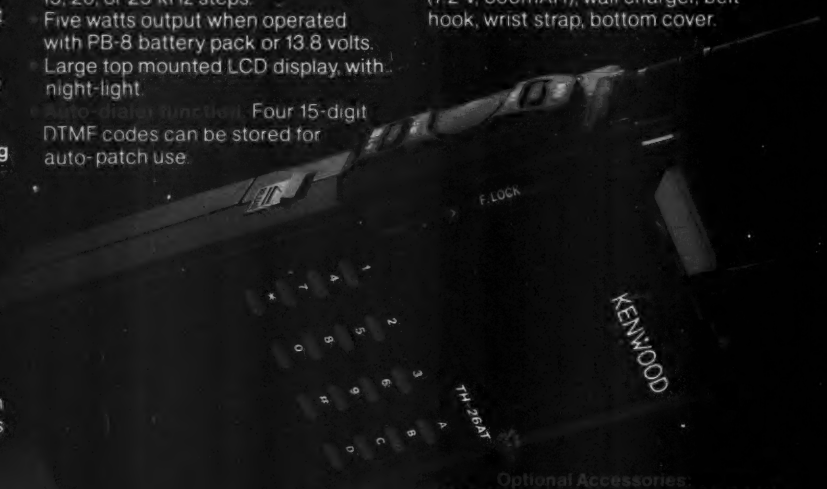
144 MHz/450 MHz

Compact Portable

FM transceivers

Quick! Grab one before it gets away! These new compact portables boast a whole set of brand-new features. The new DTMF encode/decode squelch system (DTSS) for selective calling, four 15 digit auto-dialer, DC direct-in capability (with optional PG-3F or PG-2W), versatile scanning functions, wide-range of DC power sources, 5 W capability, and an extensive list of exciting accessories make this radio the one to grab!

- **Frequency coverage:** TH-26AT: 136–173.995 MHz; TH-46: 438–449.995 MHz *(TH-26AT modifiable for MARS/CAP. Permits required.) TX on Amateur band only.*
- **NEW!** Dual Tone Squelch System ***(DTSS)*** enables selective calling with 3-digit DTMF codes! The DTSS codes can be stored in channels 1–3.
- **Multi-function scanning.** Band and memory channels can be scanned, with time operated or carrier operated scan stop.
- **21 memory channels.** Store everything you need, including CTCSS and DTSS codes. Ten channels can store RX and TX frequencies independently for odd split operations.
- **Frequency step selectable for quick QSY.** Choose from 5, 10, 12.5, 15, 20, or 25 kHz steps.
- Five watts output when operated with PB-8 battery pack or 13.8 volts.
- Large top mounted LCD display, with night-light.
- **Auto-dialer function.** Four 15-digit DTMF codes can be stored for auto-patch use.
- **T-ALERT for quiet monitoring.** Tone Alert beeps when squelch is opened. Auto battery saver, and economy power mode to extend battery life. Automatic repeater offset.
- **Supplied Accessories:** Flex antenna, PB-10 battery pack (7.2 V, 600mAH), wall charger, belt hook, wrist strap, bottom cover.



Optional Accessories:

PB-5 7.2 V, 200 mAh NiCd pack for 2.5 W output • **PB-6** 7.2 V, 600 mAH NiCd pack • **PB-7** 7.2 V, 1100 mAH NiCd pack • **PB-8** 12 V, 600 mAh NiCd for 5 W output • **PB-9** 7.2 V, 600 mAh NiCd with built-in charger • **PB-10** 7.2 V, 600 mAh (works with BC-2 wall charger) • **PB-11** 12 V, 600 mAh **OR** 6 V, 1200 mAh, for 5 W **OR** 2 W • **BC-10** Compact charger • **BC-11** Rapid charger • **BT-6** AAA battery case • **BT-7** AA battery case • **DC-1/PG-2V** DC adapter • **HMC-2** Headset with VOX and PTT • **SC-24, 25, 26** Soft cases • **SMC-31** Speaker mic. • **SMC-33** Speaker mic. w/remote control • **TSU-7** CTCSS encode/decode unit • **PG-2W** DC cable w/fuse • **PG-3F** DC cable with filter and cigarette lighter plug • **WR-1** Water resistant bag

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